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# **Patients' adoption of a digital health service in cancer treatment**

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Yleinen palveluiden digitalisoituminen ja lisääntynyt kiinnostus potilaskokemukseen on johtanut nopeutuneeseen potilaille suunnattujen digitaalisten palveluiden kehitykseen. Erilaisten digitaalisten palveluiden käyttöönottoon potilaiden toimesta vaikuttavia tekijöitä ei kuitenkaan ole kattavasti tutkittu. Lisäksi digitaalisten palveluiden vaikutukset potilaskokemukseen tarvitsevat lisää tutkimusta. Tämän työn tarkoituksena oli löytää vastauksia näihin aihealueisiin tutkimalla potilaille syöpähoitojen yhteydessä tarjottua digitaalista palvelua.

Tutkimuksen teoreettisen taustan muodostivat teknologian käyttöönotton teoriat, kuten TAM-malli (technology acceptance model), sekä käyttäjäkokemuksen ja potilaskokemuksen konseptit. Tutkimus toteutettiin kvalitatiivisesti, ja data kerättiin syöpäpotilaiden teemahaastatteluilla (n = 12). Haastateltavat jaettiin kahteen ryhmään: palvelua aktiivisesti käyttävät sekä palvelua käyttämättömät. Analyysimetodinä käytettiin temaattista analyysii. Tulosten raportoinnin tukena hyödynnettiin suoraa lainauksia haastatteluaineistosta.

Tutkimuksessa löydettiin käyttöönottoon vaikuttavia tekijöitä viidestä kategoriasta: hoitoon liittyvät, kuntoon liittyvät, tutkittuun palveluun liittyvät, yleisesti informaatioteknologiaan liittyvät, sekä muut. Tulokset tukivat aiempaa käyttöönotton teoriaa, sillä havaittu hyödyllisyys, havaittu käytön helppous, sekä havaittu uhka vaikuttivat käyttöönottoon. Tulokset kuitenkin myös viittasivat puutteisiin em. teorioiden kattavuudessa.

Tutkimuksen perusteella digitaalisilla palveluilla koetaan olevan pääasiassa positiivisia vaikutuksia potilaskokemukseen. Tutkimuksessa esille tulleet potilaskokemukseen liittyvät teemat korreloivat aikaisemmissa tutkimuksissa havaittujen teemojen kanssa. Tutkittu digitaalinen palvelu vaikutti eniten kommunikaation, informaation sekä jatkuvuuden ja integraation teemoihin.

Diplomityössä esitellään tulosten perusteella sekä teoreettisia että käytännön päätelmiä liittyen digitaalisiin terveystalveluihin potilaiden näkökulmasta.

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**Avainsanat** teknologian käyttöönottot, digitaalinen terveystalvulu, käyttäjäkokemus, potilaskokemus, syöpä

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General digitalization of services and increased interest in patient experience has fostered quickened development of digital services targeted to patients. However, the factors behind patients' acceptance of different kinds of services have not been extensively studied. Furthermore, the effects of digital services on patient experience still call for further examination. The aim of this thesis was to provide answers to these topics by investigating a digital service provided to the patients in cancer care.

The theoretical background of the study included adoption and acceptance theories, such as technology acceptance model (TAM), and concepts of user experience and patient experience. The research used a qualitative approach and the data was collected with thematic interviews with cancer patients (n = 12). The interviewees were dealt in two groups: active users of the service and non-users. Thematic analysis was used as the analysis method. Direct quotations from the data were utilized as support for the reporting of the results.

The study found factors affecting adoption and acceptance in five categories: related to the care, to personal condition, to the service in question, to IT in general, and a category of other factors. The results supported previous literature on acceptance by finding perceived usefulness, perceived ease of use, and perceived threat as predictors of patients' acceptance of digital services, but also indicated lacks in exhaustiveness of acceptance theories.

The study found mostly positive effects on patient experience. Patient experience themes found in the study correlated with previous research on patient experience. The examined digital service affected most in the themes of communication, information, and continuity and integration.

Based on the results, the thesis presents both theoretical and practical implications regarding digital health services from the patients' perspective.

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**Keywords** Technology adoption, technology acceptance, digital health service, user experience patient experience, cancer

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# **1 Introduction**

This chapter begins with discussion on digitalization of health services, patient experience and cancer treatment which provide the background and motivation for this study. Thereafter, the research objectives, scope, and research questions are presented. Finally, the research approach of the thesis is depicted.

## **1.1 Background and Motivation of the Research**

It is apparent that the progress of technology creates both possibilities and pressures to digitalize health care as it has done in many other fields as well. Already, remote patient management systems have been found to reduce use of emergency departments and nursing homes as well as hospital visits, to increase use of preventive services, health-related quality-of-life-scores, medication adherence, patients' understanding of their condition, ability to self-manage and feelings of trust, and enhance communication and feelings of connectedness between patients and medical professionals (Coye et al., 2009). However, even if digitalization preserves much development potential, implementing innovations in health care organizations hardly ever happens without difficulties (DuBenske et al., 2010), which may have slowed down the progress. Additionally, research has pointed out concerns about dehumanization of care with increasing use of technology (Huryk, 2010).

Digitalization of health services is important to observe from the perspective of medical professionals and the organizational and governmental viewpoints, but the perspective of the patients is also extremely important. In particular, the importance of the patients' viewpoint is becoming more evident as patient centeredness has become an increasingly common approach for increasing health care quality (Saha et al., 2008). Patient engagement has been shown to lead to better health outcomes and care experiences (Hibbard and Greene, 2013). Activation of patients to their own care could be enhanced with the help of technical solutions. Indeed, it has lately been more widely acknowledged that digital health technologies can be directed also to the patients (Or and Karsh, 2009). Nonetheless, there is still much to research related to patients' acceptance of digital services. For example, contradictions between expectations and experiences with the use of digital self-care applications have been pointed out (Nijland et al., 2008), indicating

further potential to more efficient design and execution of patient targeted services.

Patient experience has quickly become a much used concept in clinical settings and research as the focus of health care has shifted towards engaging patients more actively in their care, holding the experience of patient in focus, and developing a consumer mindset to health care processes (Greenhalgh et al., 2008; Hassol et al., 2004). Patient experience is frequently used as a meter for quality which is often rationalized merely with its intrinsic value, i.e. the expectation and attempt to compassionate care (Doyle et al., 2013). Nevertheless, positive effects of patient experience on health outcomes have been found both in situations where outcomes have been examined with self-assessment and where objective measures have been used (Doyle et al., 2013). Moreover, patient experience has consistently been found to relate positively with patient safety and clinical effectiveness, the latter with more evidence, in several different conditions and with several different research settings (Doyle et al., 2013). With this in mind, it is not surprising that the concept awakes increasing interest.

The rising attention towards the patients as individuals and active participants as well as the fast development of technology has led to a vast increase in different types of technical interventions and services targeted to patients. In general, people have been found to have positive attitudes towards digital development of health services (e.g. Greenhalgh et al., 2008; Hassol et al., 2004; Honeyman et al., 2005). Furthermore, digitalization of health services also seems to increase people's interest towards their health. For instance, people have been found to be more interested in examining their health record in an electronic format than a traditional paper format (Honeyman et al., 2005). However, digitalization opens up vast opportunities to different kinds of services and applications. At least partly due to this versatility, acceptance of a specific kind of a service is rarely studied extensively. Simultaneously, the adoption rates have been found to vary noticeably from one service to another (Wilson et al., 2010), pointing out that services for different purposes require discrete attention.

Kaiku Health (referred to as Kaiku in the thesis) is a web-based application that provides secured and effortless communication between patients and health care professionals. Effective physician-patient communication has been found to improve patient health outcomes (Stewart, 1995), and patients have been found to be satisfied with electronic



communication (Liederman et al., 2005). Still, recent research on patients' perspective on the subject is scarce. Another significant feature of Kaiku is to enable collection of patient-reported outcomes (PROs). Patient-reported outcomes include aspects that people are capable to report about their own health, including symptoms, physical functioning, and mental health (Bennett et al., 2012). PROs have been shown to have several positive effects on different aspects of care (see e.g. Basch et al., 2016; Bennett et al., 2012; Velikova et al., 2004), i.e. can affect patient experience in various different ways. Collection of PROs has been found to be acceptable by patients (Howell et al., 2015). However, PROs can be collected both during appointments as well as remotely. Literature on patients' acceptance to remote, electronic PRO collection is still scarce, and this research aims to lighten up this topic.

## **1.2 Research Objectives and Scope**

The main objective of this thesis is to study patients' adoption of a digital service in cancer treatments. Like mentioned, specific kinds of health services can have different factors affecting their acceptance. Such services as the one at focus of this study have not been thoroughly studied previously, and this research pursues to add to the knowledge about patient acceptance of them. Logically, this also interests the customer company as with further knowledge on the topic can help them develop the service in a direction that promotes patient acceptance more efficiently. To reach this objective, this thesis aims to identify factors that affect the patients' decision to use or not to use a digital service that is provided for them by health care professionals. Moreover, it seeks to find aspects that have an influence on whether the use becomes continuous and customary or is dismissed.

Another purpose for this research is to examine how adoption of a digital service affects patient experience. Like mentioned in the previous subchapter, the execution of health care services has lately highlighted the importance of patient perspective to an ever-increasing degree. Therefore, it is important to examine how patients react, feel, and experience addition of digital services into their health care. In other words, it is not sufficient that digital services have positive objective outcomes for the care (see e.g. Basch et al., 2016; Bennett et al., 2012), but it is crucial that the patients will perceive them as beneficial. It is also probable that if digital services succeed in enhancing patient experience, they are more likely to be adopted by the patients. Hence, the service's

existing and possible effects on patient experience are relevant for the customer company. By understanding these effects, it could be easier to better understand and meet the expectations and needs of the patients.

To encompass the objectives mentioned above, two research questions will be formed. The other will focus on adoption and acceptance of the studied service, while the other will concentrate on its interaction with patient experience. The detailed research questions are presented in chapter 3.1, after the theoretical framework of the present study has been discussed in chapter 2.

Because the customer company produces a digital service to cancer treatments, the scope of this research is defined to cancer patients. The restriction to a certain kind of illness is considered necessary also because different illness processes can have own specific characteristics that can influence aspects in the researched topics. However, due to available resources, significant comparison of such characteristics would not be possible in the present study. The scope is set to the perspective of the patients, even though it is acknowledged that the perspective of health care professionals is also remarkable for the topic. This definition was made not only because of limited resources, but also because of the greater amount of previous literature from the perspective of medical professionals. The more specific research approach is described in the following subchapter.

### **1.3 Research Approach**

According to Hevner et al. (2004), information systems (IS) research has been mainly done within paradigms of behavioral science and design science, and they proposed a framework for IS research combining these two paradigms. The framework suggests that the environment, e.g. the technology and its users, and existing knowledge base, including previous literature, theories, and methodologies, form the foundation for IS research. Upon this foundation, research aims from the behavioral science perspective to develop theories or from the design science perspective to build artifacts. Another important step of IS research is justification or evaluation of the developed or built theories and artifacts. Furthermore, the results of IS research can then be applied to appropriate environment and added to the knowledge base. (Hevner et al., 2004)

The described framework is utilized as the basis for the research approach in this thesis. Both of the paradigms included in the framework are significant for the present study. Particularly, the research question that will encompass adoption and acceptance of the service will be approached slightly more from a behavioral science perspective, while the research question that focuses on patient experience will be considered from a design science perspective. The environment in the present study is defined by the digital health service produced by Kaiku. More specifically, the environment encompasses cancer patients as the end-users of the technology. The context of the study is further described in chapter 3. In order to define the knowledge base for the study, a theoretical background is formulated in the next chapter. Based on the relevant knowledge base the detailed research methodology is refined and presented in chapter 3. Finally, chapter 5 provides answers to the research questions and discusses possible theoretical and practical implications based on the results, which are presented in chapter 4. In other words, chapter 5 comprehends the justification/evaluation phase of the research and points to the possible applications in the environment and additions to knowledge base.

This research will employ a qualitative approach to the research questions, as it is more likely to provide fruitful results to the previously insufficiently researched topic. Qualitative research can open up previously unexamined matters in a greater detail and provide better understanding on the topics than quantitative research which has been pointed out also in research on patient targeted information systems (van't Riet et al., 2001). Qualitative interviews have been used widely in IS research previously (Myers and Newman, 2007) so it is considered an appropriate method also for the this study. Myers and Newman (2007) pointed out to lacks in reporting of the interview process in earlier IS research, an issue which is aimed to be avoided by discussing the data collection and analysis methods in more detail in chapter 3.

## **2 Theoretical Framework**

The theoretical framework of this thesis is built upon literature of adoption and acceptance of information technology and the concepts of user experience and patient experience. This chapter first examines relevant theories for technology adoption and acceptance. Following that, literature on user experience is reviewed. Thereafter, patient experience is discussed. The chapter ends with synthesizing the presented literature from the perspective of this research.

### **2.1 Adoption and Acceptance of Information Technologies**

Several theories have been utilized in understanding how information technologies are adopted. In the following, the theory of planned behavior, the technology acceptance model and the unified theory of acceptance and use of technology are reviewed. The theory of planned behavior and the technology acceptance model both base on theory of reasoned action (Mathieson, 1991), whereas the unified theory of acceptance and use of technology aims to unify eight different acceptance explaining models (Venkatesh et al., 2003). Before considering these theories more thoroughly, a short general discussion on adoption and acceptance as well as the health care context is presented below.

The terms adoption and acceptance have been used somewhat overlappingly in the literature. In a review, it was noted that adoption has been used as a keyword about twice as often as acceptance (Williams et al., 2009). In this study, they are defined as suggested by Ward (2013). According to him, adoption signifies the first use of a technology and can be either voluntary or obligatory. Acceptance describes a state in which use develops into a customary practice. In other words, adoption precedes acceptance, but it can also lead to abandonment of the technology. Because of this, there can be factors affecting both adoption and acceptance as well as factors that mainly affect only the other. Furthermore, as adoption can be perceived as a necessary step towards acceptance, factors that influence adoption can be, at least indirectly, considered to affect also acceptance.

It is important to note that much of the studies on adoption and acceptance of technologies has been done in work context. Then again, research has found differences in facilitators and barriers to adoption of use between different user groups in health care context

(McGinn et al., 2011). For example, in their review of facilitators and barriers to EHR implementation, McGinn et al. (2011) noted that overall more barriers than facilitators were discussed in studies. At the same time, studies that focused on patients' views discussed facilitators more often than studies focusing on health care professionals' views (McGinn et al., 2011). The possible differences between different user-groups should be noted when applying the theories presented below to the patient context. In other words, the factors affecting adoption or acceptance by patients can vary from factors that have been found to influence these concepts in work-related research. Hence, it is also important to understand different aspects of patient experience to detect possible distinctive characteristics in the patient context.

### **2.1.1 Theory of Planned Behavior**

According to the theory of planned behavior (TPB), attitudes towards behavior, subjective norms, and perceived behavioral control predict intention to behave in a certain way. As for these intentions, they predict actual executed behavior together with perceived behavioral control. In different situations and for different behaviors the intentions and perceived behavior control differ in how much they affect the prediction of actual behavior. (Ajzen, 1991) Ajzen (1991) states that behavior is affected by salient beliefs that are relevant to the particular behavior through attitude, subjective norms, and behavioral control: behavioral beliefs form the basis for attitudes towards the behavior, normative beliefs for subjective norms, and control beliefs for perceived behavioral control. To emphasize, the theory posits that the beliefs are specific for each context, i.e. beliefs from one situation might not be applicable to another situation (Mathieson, 1991). Naturally, actual behavioral control, such as sufficient resources and opportunities, influence the chance of performing a certain behavior. However, the perception of behavioral control impacts intentions and actual behavior, too, and is therefore interesting especially from a psychological perspective. (Ajzen, 1991)

In an early review of TPB research, attitude, subjective norm, and perceived behavioral control were noted to have a more significant influence on people's desires than on intentions or self-predictions. However, intentions and self-predictions were found to predict behavior better. Overall, the review found TPB to be an effective predictor for intention and behavior. (Armitage and Conner, 2001) More recent reviews of the theory

in general are scarce. The application of the theory across domains requires definitions of the context-specific factors (Mathieson, 1991), which might also diminish interest towards reviews that are not specific to a certain field.

Theory of planned behavior has been used in health care context in multiple studies. Rather early on, a review of studies that used TPB to explain health-related behaviors found the theory be an effective illustrator for them, although with varying success rates in different behavior categories (Godin and Kok, 1996). The theory has been used in studies investigating non-technological health-related behavior (e.g. Conner et al., 2002; Cooke et al., 2016; McDermott et al., 2015; Riebl et al., 2015). In fact, it has even become a dominant theoretical approach in the field, even though it has received a considerable amount of criticism as well (Sniehotta et al., 2014). The criticism has been directed, among others, to the theory's simplicity and limited predictive validity. It has even been suggested to abandon the use of TPB and move on to testing new hypotheses and to create psychological theories to clearly defined context instead of general theories. (Sniehotta et al., 2014) This claim, however, was answered by arguing that it bases on misunderstanding of the theory and misinterpretations of negative findings as proof against the theory (Ajzen, 2015).

The theory of planned behavior has also been utilized in studies relating to health care technologies and their acceptance both from the professional perspective (e.g. Chau and Hu, 2002; Hung et al., 2012; Wu et al., 2011) and the patient point of view (e.g. Deng et al., 2014; Heart and Kalderon, 2013). In patient context, the results have indicated partial support for the theory as a predictor of acceptance (Deng et al., 2014; Heart and Kalderon, 2013). In other words, there is room for other explanatory factors for patient acceptance as well.

### **2.1.2 Technology Acceptance Model**

Technology acceptance model (TAM) was introduced by Davis (1989) and, like theory of planned behavior, it also predicts behavior from intention (Mathieson, 1991). Notably, intentions have been found to comprehensively mediate the effects of the model's central concepts on actual use (Davis et al., 1989). The central concepts in TAM are perceived usefulness and perceived ease of use. Perceived usefulness signifies the extent to which people believe the technology will enable them to perform better. Perceived ease of use

is defined as the extent to which people believe the use of the technology will be effortless. (Davis, 1989) At first, TAM proposed that the influence of these two concepts on intention is mediated via attitude toward using. Research has shown, however, that even though attitude might act as a partial mediator, there are also significant effects outside the range of attitude. (Davis et al., 1989) Still, some studies have demonstrated the effects of attitude (e.g. Davis, 1993; Huang, 2013; Yang and Yoo, 2004), so its position remains somewhat controversial.

According to TAM, perceived usefulness and perceived ease of use are explaining factors for both current and future use (Davis, 1989). However, it has also been suggested that instead of being a direct predictor of use, perceived ease of use could be a causal antecedent to perceived usefulness (Davis, 1989), while perceived usefulness is presented to have a direct effect on intention to use (Davis et al., 1989). Still, later research has demonstrated both direct and indirect effects of perceived ease of use on intention where the indirect effect is executed via perceived usefulness (Davis et al., 1989; Venkatesh, 2000). According to a meta-analysis of TAM, the foremost influence of perceived ease of use is the indirect effect (King and He, 2006). Perceived ease of use has been found to correlate with perceived usefulness also in patient setting (Liu et al., 2013). By the same token, perceived usefulness has been found to have significantly stronger correlations with current and future use than perceived ease of use (Davis, 1993; Davis et al., 1989), also in patient context (Wilson and Lankton, 2004). In some studies that have failed to find a significant impact of perceived ease of use on intention to use the respondents have been noted to have much experience with IT (e.g. Chang et al., 2015). It is possible that experience diminishes difficulties in use, which then decreases the significance of perceived ease of use (Chang et al., 2015).

With accumulating research, TAM2 was presented by Venkatesh and Davis (2000) in order to add key determinants and their involvement for perceived usefulness and use intention to the original TAM. Subjective norm, image, job relevance, output quality, and result demonstrability are defined as determinants of perceived usefulness in the model. TAM2 suggests subjective norm to have both indirect and direct effects on intention to use a system, although the direct influence exists only in settings in which use is perceived mandatory. The indirect effects of subjective norm are executed via perceived usefulness

and via image. In addition to voluntariness, subjective norm is itself affected by experience in both direct and indirect paths to intention to use. The impacts of the social determinants, i.e. subjective norm, image, and voluntariness, decrease over time while the impacts of the cognitive instrumental processes, i.e. job relevance, output quality, result demonstrability, and perceived ease of use, do not lose their significance. (Venkatesh and Davis, 2000)

While TAM2 provided extensions in the form of determinants of perceived usefulness, research has also been made in order to define determinants of perceived ease of use (Venkatesh, 2000). The determinants aim to explain establishment and change of perceived ease of use and they are dealt in anchors and adjustments. Anchors compose of general information the individual has on computers and their use, while adjustments deal with beliefs that are derived from direct experience with the system in question. (Venkatesh, 2000) More recently, Venkatesh and Bala (2008) combined TAM2 and model of the determinants of perceived ease of use as TAM3. The determinants are considered specific to the concepts. In addition, TAM3 proposes moderating effectors to the key relationships, such as increasing experience decreasing perceived ease of use's effect on behavioral intention and increasing its effect on perceived usefulness. (Venkatesh and Bala, 2008)

Albeit TAM is seen as an influential and useful theory in the field, it has faced some critique as well. On the one hand, a critique to TAM is the vast variability of used predictors in different studies utilizing it (Benbasat and Barki, 2007; Holden and Karsh, 2010). As TAM is a simple model, it is relatively easy to extend the model with additional potential predictors but this has led to a situation in which it is difficult, if not impossible, to find studies that have tested the exactly same model (Holden and Karsh, 2010). On the other hand, the theory has been criticized about its narrow scope and proposed to require integration with human and social change process variables (Legris et al., 2003). TAM3 (Venkatesh and Bala, 2008) can be viewed as an answer towards this critique.

Another remark is directed towards biased results and narrowing research field as the research has concentrated so strongly on the perspective of TAM (Benbasat and Barki, 2007). For instance, instead of actually studying what makes systems useful, most studies have focused solely on perceived usefulness and perceived ease of use without aiming to



understand how they are constructed (Benbasat and Barki, 2007). Furthermore, Holden and Karsh (2010) noted that the definitions for the model's constructs have been consistent across studies. Even though this is desirable in essence, they also pointed out that some of these definitions lead to a rather limited way of considering the constructs in question and that they are not always interpreted in a similar manner. In addition to this, around half of the TAM-related articles include at least one of the most prolific TAM researchers (Lee et al., 2003) and a considerable quantity of publications have been made in a number of key journals (Williams et al., 2015). Additionally, research has mostly overlooked other user behaviors as its emphasis has been on the amount or frequency of use (Benbasat and Barki, 2007). Finally, a substantial amount of articles report use of self-reported actual use as a limitation (Lee et al., 2003), i.e. much of the research relies on assuming sufficient connection between self-reported use and actual objective use.

Regardless of these criticisms, TAM has been demonstrated to be an advantageous model and has a robust position in research on acceptance of technology (Legris et al., 2003). Like the theory of planned behavior, TAM has been used in research in the health

care domain (e.g. Chang et al., 2015; Huang, 2013; Pai and Huang, 2011). From the perspective of physicians the results have at times been found to be less powerful than in other fields (Ward, 2013). However, positive results are also at hand. For example, TAM has been found to be more appropriate in studying acceptance by physicians than the theory of planned behavior (Chau and Hu, 2002). Like mentioned, the constructs of TAM have been found to be significant also from the patient perspective. For instance, the relationships suggested by TAM were supported when studying patients' acceptance of electronic communication between patients and medical professionals (Klein, 2007a). Moreover, perceived ease of use has been considered both as a barrier and as a facilitator and perceived usefulness has been suggested as a key facilitator in studies of EHR implementation in a review that considered both user groups (McGinn et al., 2011).

At the same time, the model is not developed specifically with health care context in mind and therefore might not be directly applicable. In fact, when analyzing the use of TAM in acceptance by health care professionals, some relationships proposed in TAM were regularly found significant while the results on others were varying (Holden and Karsh, 2010). Consistent significance was observed in the relationships between perceived

usefulness and behavioral intention, perceived usefulness and attitude, perceived behavioral control and behavioral intention, as well as between perceived ease of use and perceived usefulness. Inconsistency was detected at least in the relationships between perceived ease of use and behavioral intention, and subjective norm and behavioral intention. Even so, TAM seems to predict a considerable part of use and acceptance of health IT. (Holden and Karsh, 2010)

More recently, Kim and Park (2012) proposed HITAM, i.e. Health Information Technology Acceptance Model. In this extension of TAM, the concepts are dealt in three zones, namely health zone, information zone, and technology zone. Table 2.1 presents the antecedents and mediating processes of each zone. To bring TAM to the health care context, the model adds perceived threat as a mediating process. According to the model, perceived threat and perceived ease of use influence perceived usefulness. Then again, perceived usefulness and perceived ease of use affect attitude which predicts behavioral intention. Perceived threat encompasses the consumers' consideration of possible effects on their health and opportunities to affect these effects throughout a digital service. (Kim and Park, 2012) Supporting the construct of perceived threat, greater health care needs have indeed been found to affect patients' intention to use Internet-based patient-physician portals (Klein, 2007b).

*Table 2.1: Zones, antecedents, and mediating processes of HITAM (Kim and Park, 2012).*

<b>Zone</b>	<b>Antecedents</b>	<b>Mediating process</b>
Health	Health status  Health belief and concerns (affected by behavioral beliefs)	Perceived threat
Information	Subjective norm (affected by normative beliefs)  HIT reliability	Perceived usefulness
Technology	HIT reliability  HIT self-efficacy (affected by efficacy beliefs)	Perceived usefulness, perceived ease of use

### **2.1.3 Unified Theory of Acceptance and Use of Technology**

The unified theory of acceptance and use of technology (UTAUT) has roots in both the technology acceptance model and the theory of planned behavior. In addition to these two theories, it derives from the theory of reasoned action, the motivational model, the innovation diffusion theory, the model of PC utilization, the social cognitive theory as well as a model combining TAM and TPB. When UTAUT was integrated, it was found to perform better in predicting user acceptance than the models it is based on. (Venkatesh et al., 2003) Still, there are also studies that have been conducted utilizing UTAUT in combination with one of the underlying theories, most often TAM (Williams et al., 2015).

According to UTAUT, performance expectancy, effort expectancy, and social influence affect behavioral intention that influences use behavior. Use behavior is also affected by facilitating conditions. (Venkatesh et al., 2003) The constructs of the model and their connections to the underlying theories are depicted in table 2.2. In a recent review by Williams et al. (2015), it was detected that no single study has supported all proposed relationships, although there were many studies that did not investigate all of the relationships. Nevertheless, each relationship has been supported in some studies. Out of the constructs, performance expectancy as a predictor for behavioral intention and behavioral intention's as a predictor for use behavior have been most consistently found to be analytically strong. (Williams et al., 2015)

The model suggests that the direct determinants, i.e. performance expectancy, effort expectancy, social influence, and facilitating conditions, are moderated by experience, age, gender, and voluntariness. In UTAUT, the moderation is stated to have important effects on the direct determinant's prediction of intention or of use (in case of facilitating conditions). For performance and effort expectancy the moderators mainly affect the strength of the relationship, while for social influence and facilitating conditions the moderators affect also the significance of the relationships. (Venkatesh et al., 2003)

It has been criticized that the synthesis of UTAUT essentially wipes out the original alterations that resulted to TAM as it brings back social influences that were omitted in the construction of TAM. Hence, UTAUT is claimed to be rather similar with the theory of planned behavior. (Benbasat and Barki, 2007) It has also been pointed out that although UTAUT has gained vast amount of citations, only some of the studies citing the original

article actually use the theory or its constructs in empirical research (Williams et al., 2011). Still, according to a recent review, a satisfyingly diverse population of researchers have contributed to UTAUT-based research and it has been published in adequately broadly across different journals (Williams et al., 2015). Several studies have utilized UTAUT in health care domain both from professional (e.g. Hennington and Janz, 2007; Wills et al., 2008) and patient perspective (e.g. Baumeister et al., 2015; Or et al., 2011). The effects of the theory's proposed moderators have been demonstrated to influence acceptance of health care technologies (e.g. Kohnke et al., 2014; Wilson et al., 2010). However, their effects have not been entirely consistent throughout different studies (Or and Karsh, 2009).

*Table 2.2: Definitions on UTAUT constructs according to Venkatesh et al. (2003).*

<b>Construct</b>	<b>Definition</b>	<b>Underlying constructs</b>
Performance expectancy	The degree to which the use of the system is perceived beneficial	Perceived usefulness, extrinsic motivation, job-fit, relative advantage, outcome expectations
Effort expectancy	The degree to which the use of the system is perceived easy	Perceived ease of use, complexity, ease of use
Social influence	The degree to which the use of the system is perceived desirable/ advisable by important others	Subjective norm, social factors, image
Facilitating conditions	The degree to which the use of the system is perceived to be supported by organizational and technical infrastructure.	Perceived behavioral control, facilitating conditions, compatibility

#### **2.1.4 Other Affecting Factors from the Patient Perspective**

In addition to the above discussed theories, various other factors have arisen in studies of health-related technology acceptance. Nijland et al. (2008) found that problems with quality of care received through a digital service affected patients' compliance with the services. In addition, past and present experiences of the health care system have been found to affect people's selection to use optional electronic health records (Greenhalgh et al., 2008). Furthermore, patient-physician relationship has been shown to affect intention

to use a personal health record (Liu et al., 2013). In other words, both digital and physical care experience can have a role in adoption and acceptance of digital health services. In a similar manner, the language used in digital applications can affect patient acceptance as complexity of medical language might diminish comprehensibility of the services (e.g. Liu et al., 2011; Nijland et al., 2008).

The features of the technology, in addition to perceived usefulness and ease of use, can affect how the patients accept technologies. Duplaga (2013) studied acceptance of e-health applications among patients with respiratory conditions and found that applications that included possibilities to book appointments, renew prescriptions, and attain information were more extensively accepted than applications that were directly related to medical care, e.g. communication with health care professionals. The features of the technology can also affect perceived ease of use and usefulness, and through them have an influence on acceptance. For example, website quality has been found to be a significant predictor of acceptance of a web-based appointment system both among users with much and little prior IT experience (Chang et al., 2015). Problems with user-friendliness have been connected with lower perceived usefulness (Nijland et al., 2008). Liu et al. (2011) noted that customization possibilities can influence perceptions of digital health services. Some studies have found specific requirements for certain types of digital health services. For instance, Hassol et al. (2004) pointed out that in order to meet the expectations of the patients, electronic health records targeted to patients need to be accessible, accurate, and complete. These aspects are likely to be of great importance to patients in general, and hence to matter for other types of digital health services as well.

Not surprisingly, perceptions of privacy, security, and trust have been linked with acceptance within this context. Liu et al. (2011) found that both clinicians and patients consider privacy and security issues regarding use of personal health records. These issues encompass trust in the safety of the digital solution itself but also general trust towards the health care provider. Perceptions of safety can, for instance, depend on whether the application is downloadable or web-based and on whether it is liable to a charge or not (Liu et al., 2011). Greenhalgh et al. (2008) found that the patients' trust and confidence in the primary health care team and the national health care system influences their decision on the use of electronic health records. Then again, Hassol et al. (2004) found

that most patients had none or only a little concerns related to confidentiality and security. Correspondingly, Honeyman et al. (2005) noted general trust in security of personal electronic health records.

Reasonably, personal aspects of the user have also been noted to influence acceptance. Similar to many other domains, age, education, and general use of computers and the Internet can have an impact on technology acceptance among patients (Duplaga, 2013). Usually, younger age, higher education, and experience in use have been found to predict higher acceptance of technology. Moreover, in the health context the extent of people's health literacy and engagement has been found to affect the interest towards adopting electronic health records (Greenhalgh et al., 2008). The duration of the disease has been found to affect acceptance of e-health technology in such manner that people placed in the lower and upper quartile of disease duration showed highest acceptance (Duplaga, 2013). Nature of the illness has been detected as a key factor for the choice whether to use voluntary electronic health records (Greenhalgh et al., 2008). However, the results on the last two mentioned factors have not been entirely consistent (Duplaga, 2013).

## **2.2 User Experience**

Interest towards user experience grew rapidly in the beginning of 21<sup>st</sup> century, at least partly because the traditional usability framework focused in a rather limited manner mainly on user cognition and user performance in human-technology interactions. To bring a broader understanding, user experience has raised concepts such as user affect, sensation, and the value of the interactions in everyday life to the point of interest. (Law et al., 2009) However, the ideas related to user experience are not novel (Hassenzahl and Tractinsky, 2006). Correspondingly, Law et al. (2009) found that it is considered important to place user experience as a part of human-computer interaction domain as well as base it in user centered design practices. To point out the difference between user experience and other experiences, Law et al. (2009) suggest that user experience concentrates on interaction between a person and something with a user interface.

Nonetheless, a common definition for user experience has not been easily established in literature (Law et al., 2009), and the occurrence of user experience in relevant academic journals has been much slower than the increase of discussion about it in different

conferences (Hassenzahl and Tractinsky, 2006). The study of Law et al. (2009) was replicated by Lallemand et al. (2015), and the results were rather similar with the original study. To this date, a commonly accepted model to drive the research is missing even though the use of the concept in practice and academia has become widespread (Hornbæk and Hertzum, 2017). According to the results by Law et al. (2009), user experience is viewed as dynamic, subjective, and depending on context. In their study, the aspects that gained the most agreement among stressed the importance of the users' internal states, the context, and temporality. At the same time, the respondents disagreed with an excessively subjectivist perspective. In addition, Karapanos et al. (2009) claim that temporality, namely the development of users' experiences over time, has been neglected in preceding literature.

Hassenzahl and Tractinsky (2006) pointed out three perspectives to user experience. The first emphasizes tackling human needs beyond the instrumental, the second focuses on affective and emotional issues, and the third concentrates on the nature of experience. Each of these perspectives brings up some particular aspects to the perception of user experience and overlaps partly with the other perspectives (Hassenzahl and Tractinsky, 2006). The perspective of beyond the instrumental aims to broaden the focus of the interaction to holistic, hedonistic, and aesthetic aspects in addition to the traditional orientation to the task and instrumental value (Hassenzahl and Tractinsky, 2006). In a sense, this standpoint can be connected to subjectivity that was perceived important in the results by Law et al. (2009), because it directs the focus towards the personal needs of the user compared to focusing on the rather constant task. In fact, within this perspective a great challenge is to understand non-instrumental needs (Hassenzahl and Tractinsky, 2006).

The second perspective directs the focus on the human viewpoint on emotional and affective aspects, i.e. aims to understand how affect and emotions influence as antecedents, mediators, and consequences of technology use (Hassenzahl and Tractinsky, 2006). This perspective shares similarities with both subjectivity and context-dependence if compared to the suggestions by Law et al. (2009): the user has subjective affective and emotional tendencies and expectations, but these are also aspects that can vary from one situation to another. Compared to previous fields of research, for instance affective

computing, the user experience research has a greater emphasis on positive emotions (Hassenzahl and Tractinsky, 2006).

The final perspective, the experiential, is interested about the temporality and situatedness of technology use (Hassenzahl and Tractinsky, 2006). It sees experience as a distinctive combination of several different factors, including the product, the internal states of the user, and the timeline extending over the use itself, and the interaction between these factors (Hassenzahl and Tractinsky, 2006). In other words, the aspects of this perspective can be found related to the findings by Law et al. (2009), namely depending on context, the dynamic nature of user experience as well as subjectivity. The experiential perspective acknowledges that judgements about experiences and the actual experiences might not be identical (Hassenzahl and Tractinsky, 2006). Therefore, it is not only important to think about how the experience itself flows but also how the user will feel about it afterwards. As a conclusion of these three perspectives, Hassenzahl and Tractinsky (2006) construct a definition for user experience that states that user experience results from the user's internal states, such as, expectations and mood, the characteristics of the used system, such as functionality and complexity, and the context for the interaction, such as voluntariness of use and the environment.

The temporal aspect of user experience connects the concept noticeably with technology adoption and acceptance. Karapanos et al. (2009) proposed an initial framework for the temporal variance in user experience. According to their model, user experience evolves over time in three phases: orientation, incorporation, and identification. The flow from orientation towards identification can be paralleled to the shift from adoption towards acceptance (as defined in the present research, see above). Orientation encompasses the users' first experiences with the product, and is therefore often tinged with feelings of excitement and frustration (Karapanos et al., 2009), i.e. can be viewed as the adoption of the product. Incorporation phase includes reflection about the product's meaningfulness for everyday life (Karapanos et al., 2009). This stage can be perceived as the phase in which adoption either leads to acceptance or abandonment of the service. Finally, identification occurs as the product is being accepted (Karapanos et al., 2009).

In the light of the above connections, user experience can influence acceptance of technologies. For example, Karapanos et al. (2009) describe how during orientation



product's learnability is the major aspect determining user experience and how the emphasis moves on to usefulness as experience matures. These aspects are also acknowledged in the literature on adoption and acceptance, e.g. TAM2 and UTAUT. The effects of user experience have also been studied within the context of health-related technologies. A study of an e-hospital service's user acceptance found a positive influence by user experience both on perceived usefulness and perceived ease of use (Chang et al., 2015), the determinants of intention to use according to TAM. Still, the overlap between TAM, the most used theory in acceptance research, and user experience studies is limited (Hornbæk and Hertzum, 2017).

### **2.3 Patient Experience**

Patient experience has been establishing its position as a concept that is used in evaluating health care performance and quality. Nonetheless, a commonly used comprehensive definition is still not unambiguous in the literature. (Wolf et al., 2014) At the same time, the literature on patient experience has become intricate and grown substantially (Staniszewska et al., 2014). The Beryl Institute, a global community of practice that emphasizes collaboration and knowledge sharing in order to enrich patient experience, offers one definition for patient experience. According to this definition, patient experience consists of the sum of all interactions that affect the patient perceptions throughout the continuum of care. These interactions are influenced by the organization's culture. ("The Beryl Institute - Improving the Patient Experience," n.d.) This definition was constructed in 2010, but even after that a clear consensus and straightforward use of the definition has lacked in literature (Wolf et al., 2014).

When reviewing literature, Wolf et al. (2014) found various themes regarding patient experience that are not explicitly stated in the definition by the Beryl Institute, which could explain at least partly the use of diverse definitions. Table 2.3 presents the themes Wolf et al. (2014) found characteristic for patient experience definitions and claim to encompass patient experience comprehensively enough. Each of these themes have since been studied in the field (Silvera et al., 2017). Nevertheless, there is disparity in the amount of publications between the themes. The theme of patient perceptions is by far the most studied, the themes of integrated nature and person centeredness placing second and third, respectively. (Silvera et al., 2017)

*Table 2.3: Characteristic themes in patient experience definitions based on the findings of Wolf et al. (2014).*

<b>Theme</b>	<b>Definition</b>
Sum of all interactions (also included in the Beryl Institute's definition)	Patients have one experience that is affected by different aspects of each health care encounter and even beyond. The experience is both interactive and dynamic, and therefore should be considered continuously.
Organizational culture (also included in the Beryl Institute's definition)	The experience is not unaffected by the organization that provides the care, and this should be acknowledged when considering how the values and culture of the organization are constructed and communicated.
Patient perceptions (also included in the Beryl Institute's definition)	A crucial aspect to consider when examining patient experience as it is their experience at the end. The patient might construe the elements of health care system differently compared to professionals. Important points of focus are patient's individuality and expectations.
Continuum of care (also included in the Beryl Institute's definition)	Patient experience is not defined based on one encounter but is continuous over time and connects to both clinical, emotional, and practical interaction of health care organizations, professional, and the.
Patient and family partnership	Enabling active involvement of the patient in their care and decision-making, noting that many patients have their closed ones sharing the experience with them and that they can also affect the patient experience.
Person-centeredness	Executing treatment according to patient-centered principles (such as timely responses, supporting self-care, involvement in decision-making), acknowledging patients' points of views and refining treatment to meet individual expectations and needs.
Integrated Nature	Points to the broadness and overall integrated nature of patient experience.

In addition to the themes in table 2.3, patient experience seems to stand beyond survey results, i.e. surveys might not reach sufficient breadth and depth to properly comprise the essence of patient experience. Furthermore, it is important to note that patient experience and patient satisfaction are not synonyms, but rather satisfaction should be considered as a part of the more complex concept patient experience. (Wolf et al., 2014) The results of Wolf and colleagues' (2014) review also emphasize the importance of individualized care and patients' expectations for patient experience. These are embedded in the more general themes (see table 2.3).

The Warwick Patient Experience Framework (WaPEF) was formed upon patient-based evidence and having patients with cancer, diabetes, and cardiovascular disease at the center because this set includes both acute and chronic patients with versatile experiences. The development process of the WaPEF used the framework by Institute of Medicine (IoM) as a foundation. The themes in the IoM framework are compassion, empathy and responsiveness; co-ordination and integration; information, communication and education; physical comfort; emotional support, relieving fear and anxiety; involvement of family and friends. One key difference between the IoM framework and the WaPEF is the inclusion of the patient's active participation in their care. All in all, the WaPEF consists of seven general themes which are considered significant for high-quality patient experience. (Staniszewska et al., 2014) The themes are listed and explained in table 2.4. The boundaries of the themes are not sharp and there are several connections between the themes (Staniszewska et al., 2014), which underlines the complexity of the patient experience concept.

Patient experience has also been studied specifically in the context of cancer. Based on the review by Mollica et al. (2017) research has investigated at least aspects regarding patient-provider communication, care coordination, access to care, and patient perceptions of care quality. However, there is still much need for further research both in patient experience drivers and outcomes as well as the relationship between patient experience and different outcomes (Mollica et al., 2017). In like manner, the literature on the links between health information technologies and patient experience include many unanswered questions (Werder, 2015). According to a review by Jha et al. (2017), by acknowledging aspects of patient experience before, during, and after care delivery it is

*Table 2.4: The themes in Warwick Patient Experience Framework (Staniszewska et al., 2014)*

<b>Theme</b>	<b>Definition</b>
Patient as active participant	Acknowledging the patients' role as active participants in their care, decision-making, creating and managing their health. Points to responsibility of self-care and to importance of confidence in self-management.
Responsiveness of services – an individualized approach	Noting patients as persons and individuals, tailoring provided service according to the needs and preferences of the patient, meeting clinical needs and expectations of the patients. Evaluation of the health care services from the viewpoint of the patient.
Lived experience	Consideration of the unique experience of the patients, the condition's physical and cognitive effects, the broader life context (such as family, everyday experiences, feelings, expectations) as well as realization that the patients bring these experiences into the health care system even if some of them are derived outside of it.
Continuity of care and relationships	Coordination and accessibility of services, continuous relationships with health care professionals, mutual respect, building trust over time.
Communication	Acknowledging the significance of communication style and format, reciprocal communication, showing enough skills and compassion, possibilities to questions, and recognizing the patient as an individual.
Information	Providing sufficient information to enable patient participation to decision-making and self-care, both acting as and providing sources of information, considering individual needs for information, and ensuring the quality of the provided information.
Support	Considering different preferences and needs for support, including emotional and informational as well as different sources of support. Noting the patients' need not to be a burden.

possible to create improved outcomes and build an actual relationship with the patient. Furthermore, organizational profitability can also be influenced through patient experience (Jha et al., 2017). In attempts to improve patient experience, a common success preceding factor is to have the right and properly implemented technology that supports the improvement. Technology should not, however, transfer too much focus from traditional procedures, e.g. from touch, smiling, and sufficient updates to the patient. (Werder, 2015)

## **2.4 Synthesis of the Theoretical Framework**

Like already tentatively indicated in the individual discussion on the different theories and concepts, various connections can be drawn between them. Their reciprocal relationships are interesting and relevant when considering the topic of the present research.

Connections between technology adoption and acceptance and user experience are noted also in previous literature even though surprisingly few studies have studied them simultaneously (Hornbæk and Hertzum, 2017). To begin with, the dynamic nature of user experience parallels with subjectivity of many of the constructs of technology acceptance theories, such as perceived usefulness and perceived ease of use from TAM or performance expectancy or effort expectancy from UTAUT. Furthermore, user experience's dependence on context and situatedness pair up with UTAUT's facilitating conditions and the fluctuating social components of acceptance theories. As pointed out by Karapanos et al. (2009) different aspects affect user experience when the use of a service or product is observed at different stages of time. Acceptance and adoption can be considered in like manner: some features can influence adoption meanwhile others have an effect on acceptance. Finally, user experience and technology acceptance are likely to be influenced by similar aspects of the technology and its use-case, but also to affect one on the other. According to Hornbæk and Hertzum (2017), research on TAM and user experience has brought knowledge on what constructs affect adoption and use of technology and their relationships with each other, but has yet to find out why the relationships occur and how the context affects the models' applicability.

Being a patient is in many ways different from being a customer, an employee, or a user of a recreational service. When one gets sick, it is usually involuntary and brings along more negative emotions and physical effects. Yet, while being a patient one does not cease to be a human or a user of different kinds of services. To put it differently, several aspects from more general concepts, such as user experience, hold true also in patient context even though the existence of some context-specific prerequisites is plausible. The concepts themselves also share some similarities. First of all, both user experience and patient experience evolve with time and are considered to a certain degree as subjective. At the same time, it is usually objectively or generally designed services that aim to affect these individual experiences while being generally efficient. With both concepts it is important to continuously acknowledge how the experience is constructed and how it is perceived. As patient experience matures, different aspects might become important for an excellent user experience.

An important difference between the concepts is the extent of interaction between people and between human and computer. User experience is suggested to deal with human-computer interaction (see e.g. Law et al., 2009), while patient experience has traditionally depended on interaction between medical professionals and the patient and their close ones. However, digitalization of services increases the amount of human-technology interaction also in patient experience. Finally, user experience is considered to have an emotional and affective perspective. This perspective might have a bigger emphasis in the context of patients than in many other user contexts because patient experience often includes several emotional and psychological effects. In other words, this perspective to user experience might require more attention than in other user contexts.

Digitalization seems to have plentiful effects on patient experience, which adds to meaningfulness of research among digital health services. To point out a few examples, the Internet has become a powerful resource for medical information (Keselman et al., 2007) and digital services have been found to enhance patients' perceptions on the relationship with medical professionals (Honeyman et al., 2005). Furthermore, interactive health communication systems benefit patients by enabling organized access to information, bringing patients and medical professionals closer throughout a channel for communication, and by providing coaching through collecting user produced

information, providing feedback and advantaging algorithms or decision rules (DuBenske et al., 2010). Each of these effects can be linked with at least one theme from the Warwick patient experience framework. However, to make these effects real the patients first have to adopt the technologies, and this is not always so simple. For example, when people perceive both benefits and disadvantages in engaging to digital health services, they tend to compare the extent of them when considering about adoption or abandonment of the service (Greenhalgh et al., 2008). This comparison is affected by situational factors, i.e. in some situations people might be ready to accept greater disadvantages against benefits than in others (Greenhalgh et al., 2008). The situational factors can vary quite much at different points of patient experience, e.g. due to varying condition and accumulating (positive, negative, or neutral) encounters with health care system.

In a study by Keselman et al. (2007), over half of the respondents brought up comprehension issues of personal health records that were associated with lacking conceptual knowledge and almost half issues associated with medical language. Medical language can be confusing and too intricate (Liu et al., 2011), which might affect not only acceptance of digital services in health care domain but also have an impact on patient experience. If digital services lack in clarity of the language they use, they can be interpreted as difficult or ineffective, which can lead to abandonment of use. If use continues nonetheless, it can cause confusion, misunderstandings, and frustration which can be linked to many themes regarding patient experience, such as communication, information, active participation of the patient, and lived experience. This serves as an example of how the discussed theoretical concepts can affect one another.

To point out some other connections between patient experience and acceptance of technologies, lack of close alignment with people's attitudes (patient perceptions), self-management practices (active participation of the patient), identified information needs (information) as well as the wider care package (continuum of care) considerably raised the risk for personal electronic health records to be deserted (Greenhalgh et al., 2010). On the other hand, usefulness of a telehealth intervention has been found to relate to its ability to offer needed information, to enhance self-management, and to provide support (Head et al., 2011), i.e. can be connected to the themes of information, active participation of the patient, and support. To summarize, the themes of patient experience affect widely to

perceived usefulness and ease of use of digital health services. In other words, consideration of the themes and how a digital service enhances experience within them can have an effect on acceptance of the service.

In conclusion, the concepts of the theoretical framework of this thesis are expected to interact with each other, and the empirical research aims to find such interactions. Therefore, understanding of the presented concepts is important for the data collection and analysis processes which are described in the next chapter.



### 3 Methods and Data

This chapter presents the methods and material of this thesis. First, the detailed research questions are formulated. Then, the data collection and data analysis processes are described. Finally, the research context and the subjects of the study are presented.

#### 3.1 Research Questions

As discussed in chapter 1.2, the objective of this research is two-fold. On the one hand, the aim is to investigate adoption and acceptance of a digital health service among cancer patients. On the other hand, the research intends to find out how such a service affects patient experience of cancer patients. To answer these different objectives two research questions are formed. Theoretical foundation to support the questions was presented in chapter 2. For the first research question, each presented theoretical concept is relevant. Adoption and acceptance theories assess several constructs that predict adoption and acceptance, such as perceived usefulness and perceived ease of use in TAM (Davis, 1989), and performance expectancy, effort expectancy, facilitating conditions, and social influence in UTAUT (Venkatesh et al., 2003). However, these constructs are macro concepts that are formed based on several more specific factors. The factors are likely to include both factors that promote adoption or acceptance, i.e. facilitators, and factors that hinder them, i.e. hindrances. The factors that build up the macro concepts vary from one context to another. For that reason, patient experience related concepts can possibly be linked with the factors that influence adoption and acceptance and the context should be defined in the research question. Consequently, the first research question is formulated as follows:

*RQ1: What kind of factors act as facilitators or hindrances for cancer patients' adoption and acceptance of a digital service in cancer care?*

As for research question 2, it builds up on the concepts of patient experience and user experience. After adoption and acceptance, the user experience of the service is likely to have an impact on the way and extent in which the service affects patient experience. Nonetheless, this research does not concentrate solely on the effect of user experience and including it explicitly to the question was perceived to constrict the question as too narrow. Based on previous research, patient experience is composed of several different,

yet overlapping themes (Staniszewska et al., 2014; Wolf et al., 2014). However, because the effects of digital services to patient experience have not been extensively studied, and especially the specific kind of a service as Kaiku has not been examined thoroughly, it is not meaningful to define the question from a more specific perspective of patient experience. This way, the question enables detection of each different patient experience theme that occurs spontaneously in the data. Accordingly, the second research question is framed as follows:

*RQ2: How does the use of a digital service for cancer patients affect patient experience?*

The framing of both of the questions highlights the patients' perspective as it is at focus of this thesis. Even though medical professionals are also important end users of Kaiku, the patients are at least as crucial. Like discussed in chapter 2, patients' adoption and acceptance of digital services can vary from health care professionals' adoption and acceptance. Furthermore, the questions specify the patients as cancer patients which was considered essential as different diseases have distinct characteristics, both regarding the treatment process and the disease process itself. Thus, without the further definition the question would have seemed too general, specifically from the viewpoint of the objectives of this study.

Like discussed in chapter 1.3, the first research question is approached from the behavioral science paradigm which aims to seek the truth of concepts (Hevner et al., 2004), while the second is approached from the design science paradigm which aims to reach utility (ibid.). However, truth and utility are claimed inseparable (Hevner et al., 2004), and as the research approach framework enables the combination of the two paradigms, the data collection and analysis methods were constructed mutually considering perspectives from both paradigms. Furthermore, the empirical research was not distinctively dealt between the two research questions, i.e. the themes and the structure of the interviews were not designed to be linked with only one of the questions. Instead, it was expected that themes related to the research questions could arise overlappingly when the interviewees talk about their experiences related to the cancer and related to the service in question. In the following, the data collection process is discussed more thoroughly.

### **3.2 Data Collection Method**

Adoption and acceptance have been much more often studied with quantitative than qualitative approach. Surveys have been the most popular method of choice in adoption research. (Williams et al., 2009) This research, however, was conducted with a qualitative approach due to the fact that the specific topic has not been extensively studied before. In addition, it was deemed a more suitable approach from the perspective of the second research question. Data was collected with one-on-one interviews with cancer patients. Qualitative interviews are suitable when aiming to reach the interviewees' wider experiences and perceptions (Taylor, 2005), which is the purpose in this study. The interviews were designed thematic or unstructured interviews, i.e. the themes for the interviews were determined in advance in order to make sure that each targeted topic is discussed but no fixed questions are formed (Eskola & Suoranta, 2008). The benefits of unstructured interviews include, among others, that they enable clarification of answers and a more relaxed atmosphere (Bowling, 2014), which are essential for this research due to the sensitive topic, i.e. the interviewees' personal health. However, interviews do not seize actual behavior which can differ from how people reconstruct events (Taylor, 2005). Nonetheless, as the topic of this research has not been extensively studied, interviews were considered most profitable method to access new knowledge.

The research used a purposive sampling approach. The small sample size diminishes possibilities to generalizations, and randomization of selection of interviewees in such cases does not improve generalizability markedly (Bowling, 2014). Because of this, and due to the objectives and scope of the research, purposive sampling was considered most appropriate method. The interviewees were recruited from three customer clinics of Kaiku Health. Due to patient confidentiality and privacy, the patients were first contacted by a familiar nurse. After their permission, the researcher was provided with their contact information in order to arrange an interview. The interviewees and the customer company are more thoroughly presented in chapter 3.4.

The interviews were conducted in May-July 2018. The data was collected in Finnish. Most of the interviews took place at the interviewees' homes due to the personal issues discussed in the interview topics which made a private place more preferable. Another reason for this kind of location selection was that the interviewees were recruited from

several places in Finland, and it was seen as more appropriate that the researcher traveled to reach the interviewees than that the interviewees would have had to travel to the researcher. Three interviews were conducted in a public place, one in a library (id #4), one in a coffee shop (id #11), and one in a private meeting room of a service station (id #12). In each of these cases, the interviewee was the one to suggest the public place, and the researcher made sure that they understood the private nature of the interview and that they felt comfortable to speak openly even in a public place. In three interviews (ids #5, #6, and #8) the partner of the interviewee was present at parts of the interviews. With eleven of the interviewees there was an additional discussion after the interview. These ranged from short, 10-30-minute conversations ( $n = 5$ ) to longer than 30-minute discussions ( $n = 6$ ), even combined with joined lunch or coffee. These discussions partly repeated the themes of the interviews but also expanded to new, at times even personal topics. The additional discussions can be interpreted to indicate that the interviewees truly felt comfortable with the researcher.

Owing to the objectives of the research, patients were aimed to be recruited from three subgroups: 1) patients who use the application, 2) patients who have been presented with the application but have not tried its use, and 3) patients who have tried the application but have not continued its use. However, it turned out to be challenging to reach patients from the last group, and thus the interviewees were dealt in two groups instead: 1) active users of Kaiku, and 2) patients who do not use Kaiku. The characteristics of the interviewees and the consistence of the groups are more exhaustively depicted in chapter 3.4. Previous research has sometimes faced challenges in studying non-adoption (e. g. Greenhalgh et al., 2010). This could be seen in present study as well, as it seemed that it was easiest for the contact nurses to recruit people who actively used the service. Nevertheless, the final groups sizes were adequately even.

Even though the unstructured interview design, a guiding interview structure was formed based on existing literature on the subject. The purpose of the structure was to support conducting the interviews by making sure that even if the interviewees would not unprompted find matters to talk about, the interviewer would have some questions to help the conversation. The structure is dealt in four sections: background of the interviewee, cancer and everyday life, Kaiku and everyday life, and other upcoming issues. Excluding

the background information section, the questions were designed open-ended in order to enable novel ideas and perceptions about the topic. It should also be noted that the conversation in the interviews could jump back and forth between the section depending on how matters occurred to the interviewees. The structure consists main questions and subquestions. The main questions open up the themes, and these were basically asked from each interviewee, even though the order varied depending on the proceeding of the interview. The subquestions served as help if the interviewee found it difficult to share their experience only based on the main questions. In addition, they aimed to ensure consideration of the relevant topics in case they were not covered in the interviewee's answers to the main questions. The complete interview structure and its translation is provided in appendix 1.

In the beginning of the interviews, some background information was asked in order to warm up the interviewees and to provide with relevant information regarding the research. Demographic factors affecting technology adoption in health care have been studied in multiple studies. Based on previous research age (e.g. Deng et al., 2014; Heart and Kalderon, 2013; Sarkar et al., 2011; Yamin et al., 2011), education and profession (e.g. Sarkar et al., 2011; Wilson et al., 2010), habitation (e.g. Yamin et al., 2011), and other state of health (e.g. Yamin et al., 2011) were included to the questions. Then again, the study results on some of these demographic factors have not been consistent. For example, Or and Karsh (2009) found in their review of patient acceptance of consumer health information technology that the effects of age were varying. In addition, the purpose and execution of this research decreases the importance of the demographic factors as the sample size is small and the data are qualitative. Thus, the background section served more as an introduction and warming up for the interviewees.

In the next section the interviewee got a chance to tell their own story regarding the experience with cancer. This section aimed to create an understanding of the individual's path with cancer and to get a grasp on their patient experience. It was decided that by letting the patients talk about their experience in a story-like manner instead of presenting more specific questions it could be observed what kind of themes related to patient experience arise spontaneously. By letting the interviewees first tell a story about their experiences, it was considered more likely that patient experience themes would

spontaneously come up also in the next section, in which the conversation was moved towards Kaiku.

The third section transferred the focus on Kaiku. This section varied the most due to different degrees of Kaiku's use. The section included questions about how the interviewees had been presented with Kaiku, as previous research has found indications that the manner of introduction of a digital health intervention can affect adoption (Sanders et al., 2012). Other questions in this section dealt with how the initial use experience had gone, typical use cases, and ideas or feelings that the service raises. The basic constructs of TAM were included in the subquestions of this section. For example, the interviewees were asked what particular aspects of the service make it useful or how the service could have been more useful for them if they did not touch upon these when talking about the service.

Finally, the last section aimed to provide space for the interviewee to bring up issues on their mind that had not been discussed previously during the interview. The atmosphere can be more relaxed towards the end, so it can be easier for the interviewee to bring up aspects that the interviewer has not directly asked about. In this section, feedback was asked both about Kaiku and about the research. Asking for feedback on the interviews would have enabled adjustments to following interviews in case of clear confusions or other difficulties. However, the interviewees did not bring up any problems with the interviews.

The interviews were recorded, and the tape recordings were transcribed word-for-word. The interviewees were asked for their consent to the recording. Names or other identifiable words were replaced with filler words in order to avoid identification of the interviewees from the transcripts. After the transcription, the recordings were deleted to ensure decorous handling of the data. The transcription was begun shortly after the first interviews in order to facilitate learning from possible limitations with the interview structure or technique. The transcription process can be viewed as the initial phase of the data analysis process, which is described in the next subchapter.

### **3.3 Data Analysis Method**

The collected data are narrative in nature (Taylor-Powell and Renner, 2003). The analysis process was guided by suggestions of Taylor-Powell and Renner (2003) as well as Braun and Clarke (2006). The former provides guidelines for qualitative analysis in a more general manner, while the latter focuses on thematic analysis which was chosen as the analysis method for this study. Thematic analysis a commonly used qualitative analytic method, even though its use is sometimes not explicitly stated in reports (Braun and Clarke, 2006). Thematic analysis aims to recognize patterns or themes within data and, unlike some other methods, is independent of specific theory and hence applicable across many theoretical approaches (Braun and Clarke, 2006). It was perceived as suitable for this study because its object is to detect novel themes to the topics in addition to building up on existing literature.

According to Taylor-Powell and Renner (2003), two common approaches are used for focusing the analysis in qualitative analysis: focus by question, topic, or specific time period or event, or focus by individual or group. These approaches can also be combined (Taylor-Powell and Renner, 2003). The interviewees of this research were dealt in two subgroups (see chapter 3.2 and 3.4) and aimed to identify differences among these subgroups. Therefore, a combination of the two common focus approaches was chosen as the focus approach for the analysis. The data were analyzed by topics and by the subgroups (see table 3.1). In line with this, Braun and Clarke (2006) suggest that the type of analysis should be defined in the sense whether the analysis aims at an exhaustive description of the entire data set or of one particular theme or group of themes within the data set. In the case of targeting a rich description of the entire data set some complexity can be forfeited but the approach is nonetheless suitable especially when the research is done among something that has not been extensively studied before (Braun and Clarke, 2006). Due to these reasons, the analysis of this thesis was chosen to seek a comprehensive picture of the entire data set. The topic of this research has not been studied particularly extensively, and therefore this research aimed rather to identify new themes to the topic rather than explore themes known previously. Comparatively, the analysis followed an inductive approach (Braun and Clarke, 2006).

The data consisted of nearly 70 000 words of transcript. Qualitative analysis is suggested to begin with by getting to know the data (Braun and Clarke, 2006; Taylor-Powell and Renner, 2003), so the first phase of the analysis was reading through the transcripts produced in the data collection process. Simultaneously, the transcripts were checked against the recordings, as recommended by Braun and Clarke (2006). At this phase, initial ideas of patterns and themes were written down. These notes formed the basis for the next phase, in which the data were coded. At first, the coding was done in quite specific detail. As mentioned above, the analysis was performed using an inductive approach and, in accordance, the coding process was data-driven, and the categories were formed emergently (Taylor-Powell and Renner, 2003).

*Table 3.1: The topics and subgroups in the focus of the analysis.*

<b>Topic</b>	<b>Subgroup</b>
Factors affecting acceptance or adoption	Active users
Patient experience	People who do not use Kaiku
Kaiku's effects	

After a few coding rounds, initial categories were formed from the perspective of the research questions. At this point, the coded data extracts were arranged to the initial categories. While this sorting was performed, the themes were iteratively formed by considering how different codes are similar or distinct from each other. (Braun and Clarke, 2006) In addition, connections were searched both within and across categories (Taylor-Powell and Renner, 2003). While initial themes were considered, connection points to existing literature were observed. Especially with the topic of patient experience these connection points aided the formation of the themes. At first, no coded data was discarded as suggested by Braun and Clarke (2006). In fact, it can be insightful to consider especially those extracts that at first do not seem to fit the themes (Taylor-Powell and Renner, 2003). Towards the end, extracts that were perceived noteworthy but did not fit well into the categories were labeled as “other interesting”.

When sorting of coded data extracts was done, the present themes were reviewed and edited to ensure consistency within themes, distinctiveness across themes, and a match between the themes and the data set (Braun and Clarke, 2006). During the analysis



process the data was read through multiple times. When possible overlaps between different themes were detected, the essence of the themes and the data extracts in question were reviewed by the researcher. If necessary, extracts were placed within more than one theme. The analysis process was finished by interpreting the resulted themes and their attachment with previous knowledge on the topic.

Atlas.ti and Microsoft Excel were utilized in the analysis process. Atlas.ti is an efficient tool for qualitative data analysis as it allows marking of quotations, code allocation and their management. In addition, it allows grouping of different documents which enables comparison between two sub-groups within the study. Therefore, selection, coding, and management of quotations was conducted with Atlas.ti. Excel, on the other hand, provides a fitting tool for counting and sorting of categories and quotations. Thus, it was used when the initial codes were sorted to form the themes from the data. Furthermore, Excel was employed to organize, count, and manage the categories and the amount of quotations in them.

As suggested in literature (e.g. Braun and Clarke, 2006; Taylor-Powell and Renner, 2003), it was acknowledged during the analyzing process that the perspective and lenses of the researcher can affect the analysis process. This is more thoroughly discussed in chapter 5. The results of the data analysis are presented in chapter 4.

### **3.4 Research Context and Subjects of the Study**

The customer company of this research is Kaiku Health Oy (previously Netmedi Oy). The company was founded in 2012, and today it employs over 30 people in Finland and Germany. Kaiku Health produces a proprietary platform, that is based on Ruby on Rails. The product, also called Kaiku Health (later Kaiku in this thesis), is built on the platform. Kaiku has obtained CE marking as an MDD class 1 medical device. The platform is available in seven languages, and it is currently used in over 30 hospitals and clinics in Nordic countries and Central Europe. The platform enables customization according to the specific needs of different medical fields and use-cases. In other words, the content and visual characteristics of the applications can be tailored to meet the many-sided and varying requirements of different customers. The user interface enables use of the application on different kinds of end devices including mobile phones, tablets, and

computers. In addition to cancer care which is at focus of this research, the company also develops applications that are utilized in other medical fields, for instance fertility care and preventive care. Within cancer care, Kaiku can be utilized in all common cancer types and is compatible several different cancer care pathways, such as surgery, systemic or radiation therapies, and follow-up.

Like shortly described in chapter 1, the key features of the applications directed in cancer care include gathering of patient-reported outcomes and opportunities for communication between the patients and health care professionals. PROs have been shown to enable improved communication between the patient and medical professionals (Velikova et al., 2004), improved clinical care due to faster reactions and saved time (Bennett et al., 2012), enhanced emotional well-being (Velikova et al., 2004), better health-related quality-of-life (Basch et al., 2016; Velikova et al., 2004), and fewer admissions to ER or hospital (Basch et al., 2016). Kaiku enables scheduled assembling of PROs through validated PRO questionnaires. In addition, collection of other clinical data, such as laboratory results. Input of clinical data can be done manually but also via integration with the clinics' electronic medical records and pulling the values directly from them. Gathering of different kinds of clinical data enables Kaiku to provide customized follow-up programs as well as real-time monitoring of patients' well-being during treatments.

Kaiku allows patients to securely communicate with medical professionals through a chat-like feature which permits Transport Layer Security (TLS) encrypted messaging via web browser. This supports, among others, the patients' capabilities to ask questions from medical staff when something concerns them. Electronic communication between medical professionals and patients has been found to correlate with reduction of office visits and increases in measurable quality outcomes and patient satisfaction (Baer, 2011). Furthermore, patients provided with electronic patient portals have been found to show greater satisfaction with communication and overall care (Lin et al., 2005). Patients using electronic communication with medical professionals have demonstrated it effective for illness management (Houston et al., 2004). The electronic communication portals have been praised for convenience and reduced communication barriers, but also for enabling direct physician responses (Lin et al., 2005). In addition to the chat-like communication, the researched application enables patients to report symptoms they experience due to the

illness or as adverse effects. Severe symptoms alert the medical professionals, while mild symptoms prompt self-care instructions making digital patient support and education possible.

As mentioned in chapter 3.2, the interviewees ( $n = 12$ ) were recruited from three Kaiku Health's customer clinics. One of these clinics operates in the private sector, two in the public sector. The interviewed patients suffered from different types of cancers, and the duration and phase of the disease varied. The age range of the interviewees was 58-79 years old, and there were six women and six men among the interviewed patients. A description of the interviewees is presented in table 3.2. The interviewees were dealt in two groups (see chapter 3.2), patients who use Kaiku and patients who do not use Kaiku. The first group included 7 patients, the latter 5 patients. In the group of active users, one (id #11) thought of herself as a non-user because she had stopped answering to the PRO questionnaires. However, she described active use of the chat feature, and thus was considered as an active user. In the group of non-users, three (ids #3, #7, and #8) had never used Kaiku, one (id #6) had signed in a few times, but never reacted to anything through the service, and one (id #2) could not recall whether she ever signed in or filled out a PRO questionnaire.

*Table 3.2: Interviewees of the study.*

<b>ID</b>	<b>Kaiku's use</b>	<b>Age, gender</b>	<b>Cancer</b>	<b>Diagnosis, phase, treatment</b>
1	User	68, female	Myeloma	Dg 20 years ago, chronic, active treatment
2	Non-user	73, female	Myeloma	Dg 3 years ago, chronic, active treatment
3	Non-user	69, female	Myeloma	Dg 5 years ago, chronic, active treatment
4	User	60, male	Prostate	Dg 1.5 years ago, curative treatment follow-up, no active treatment
5	User	67, male	Prostate	Dg less than 1 year ago, curative treatment follow-up, no active treatment
6	Non-user	72, male	Prostate	Dg 2.5 years ago, curative treatment follow-up, no active treatment
7	Non-user	66, male	Prostate	Dg 3 years ago, curative treatment follow-up, hormonal treatment
8	Non-user	79, male	Prostate	Dg over 20 years ago, curative treatment follow-up, no active treatment
9	User	74, female	Ovarian	Dg 1 year ago, chronic, active treatment
10	User	70, female	Ovarian	Dg 5 years ago, chronic, active treatment
11	User	58, female	Ovarian	Dg 10 years ago, chronic, active treatment
12	User	58, male	Myeloma	Dg 4 years ago (first cancer over 30 years ago), chronic, active treatment (medication)

## 4 Results

The results of the study are presented in this chapter. The analysis of the data resulted in altogether 637 quotations. These were coded in the analysis process as discussed in chapter 3.3. The final lists and prevalence of different codes can be found in appendix 2. 347 quotations were coded with only one code, 290 received multiple codes. Appendix 2 also shows the distribution of the quotations between the interviews.

### 4.1 Facilitators and Hindrances of Adoption and Acceptance

Based on the data, several facilitating and hindering factors were found for adoption and acceptance of the digital service provided during cancer treatments. These factors could be categorized in five themes that are depicted in table 4.1. The categories of care/treatment and Kaiku related were the most frequent with 70 and 72 quotations, respectively. The three remaining categories included condition related with 27 quotations, IT related with 23 quotations, and other with 24 quotations. The complete results can be found in appendix 3. The aforementioned categories are further presented in chapters 4.1.1-4.1.5. At first, however, an observation about the presentation of the service that could not be categorized within the themes but can be connected to adoption and acceptance is discussed below.

The data provided with some implications of the importance of the presentation of Kaiku. According to the interviews, all 12 interviewees had been presented with Kaiku by their cancer nurses. Two of them (id #1 and #10) mentioned presence of a doctor when Kaiku was presented for them. Some noteworthy differences were detectable when comparing how the interviewees told about the presentation of Kaiku. Of course, each of the following observations base on individual cases and no explicit connections could be drawn from them to adoption or acceptance. Hence, they are discussed here as points of interest rather than explicit facilitators or hindrances for use. First of all, only one patient (id #12) described a step by step presentation of the service at the reception.

*“[Int] What kind of thoughts did it provoke at the beginning?”*

*[#12] Good, really good. Because even I could understand at once how the system works.*

*[Int] Yes. And when he presented it, did he just tell about it orally or did he somehow show on the computer as well?*

*[#12] We went everything through with the computer. [...] He really did show it very well then.” [12:21]*

*Table 4.1: Facilitators and hindrances for adoption and acceptance, and their occurrence in the data.*

<b>Theme</b>	<b>Description</b>	<b>Facilitator</b>	<b>Hindrance</b>	<b>Total</b>
Care/treatment related	Factors related to the provided care and the relationship between medical professionals and the patient	37	33	70
Condition related	Factors that are affected by the individual's state of health	4	23	27
IT related	Factors related to general IT skills, experience, and use	7	16	23
Kaiku related	Factors related to the idea, execution, or performance of the service	49	23	72
Other	Factors that could not explicitly be placed under the other themes	3	20	23

This interviewee emphasized the easiness and clarity of the service in several occasions. On the contrary, another patient (id #10) described the presentation as rather short due to limited time during the reception. She had received some brochures about Kaiku but stated that she did not gain further understanding from them. In fact, she indicated clear confusion with the service during the interview as well as disappointment with the service caused by this confusion. In a similar manner, one patient (id #9) explained that she had mostly listened the presentation of the service as a bystander when a nurse had discussed it with another patient. Like patient #10, she also stated that her initial picture of Kaiku did not really match the reality. Based on her comments, it could be interpreted that this confusion had decreased her enthusiasm towards the service. It is important to recognize the age difference between these patients (id #12 is 58 years old, id #10 70 years old, and id #9 74 years old), because it might affect their general capabilities to accept and use

digital services. Nonetheless, it is also possible that the success of acceptance is affected by the way in which the service is presented.

#### **4.1.1 Factors Related to Care or Treatment**

The category of care/treatment related factors consists of aspects that are connected to care or treatment processes as well as to the relationship between the medical professionals and the patient. In this category, there were slightly more facilitators than hindrances, 37 compared to 33, respectively. Eleven out of the twelve interviewed patients offered aspects to this category. The patient who did not consider these types of aspects was from the non-user group.

The most prevalent factor in this category was preference for or confidence in traditional methods for communication or gaining information. This hindrance was constructed by descriptions of preferring to call medical professionals (see quote 6:43) and describing face to face communication as sufficient (see quote 7:47) or better than communication through a digital service.

*“I felt that I only have a very, very short matter and it is taken care of by calling so... I didn’t like see it necessary, the use of Kaiku.” [6:43]*

*“[...] I haven’t used it. I think that I have received such sufficient information, knowledge, and instructions face to face, this way.” [7:47]*

Other hindering factors the interviewees raised to this category were lack of consideration of the treatment’s phase in Kaiku (see quote 5:41), need for acute contact with medical professionals (see quote 11:22), and distorting of information that is conveyed to the medical professionals.

*“[#5] [...] the questions like, they should absolutely be personalized according to the phase of the treatment path. [...] hell, don’t ask, well, about erection when one comes from the brachy treatment, so it is quite a harsh question that*  
*[Int] Mm.*

*[#5] do you have terrible difficulties with this and that when one has received that kind, that kind of amounts of becquerels that it doesn’t occur to one straight away.” [5:41]*

*“Of course, if there was a terrible distress and such like, so I would always call there.” [11:22]*

Receiving reactions from medical staff were brought up as facilitators for Kaiku's use and the lack of reactions as a hindrance. Other facilitators within this category included Kaiku enabling of faster or more efficient and convenient communication between the patient and medical professionals (see quote 12:18), feeling obligated towards the medical staff to use the service, perceiving the service relevant for medical professionals, viewing Kaiku as a way to maintain patient relationship (even after active treatments have stopped), considering Kaiku's use to have positive effects on physical appointments, and Kaiku bringing the medical professionals closer or more accessible (see quote 1:36).

*"[#1] that I knew I have like a kind of safety there, I can be in contact. [...] I don't have to ponder things alone. [...] there are the people who hear or read me straight away then.*

*[Int] Mm. Right.*

*[#1] It was the feeling of safety." [1:36]*

*"[#12] So if I have a question [...] so I sent a question and the nurse called the next day.*

*[Int] Yes.*

*[#12] So the threshold to ask something is much easier." [12:18]*

Finally, one patient (id #5) pointed out that active communication with medical professionals has been found to affect the prognosis of the patient in a positive manner, and this motivated him to actively use the service.

#### **4.1.2 Factors Related to Personal Condition**

The category of condition related factors comprises aspects that associate with the state of health of the individual which, especially among cancer patients, can vary quite radically from time to time. The factors within this category included noticeably more hindrances than facilitators (see table 4.1). Seven out of twelve interviewees presented factors to this category, three from the group of active users and four from the group of non-users.

Weak condition was connected to lack of energy to use the service. One patient (id #2) viewed this as the primary reason for lack of acceptance of the service. Two other patients brought weak condition up as a potential reason for lack of use.



*“Some information came quite quickly to the computer, but right then I had become sicker [...] that I was more tired.” [2:16]*

Another remarkable hindrance was lack of interest to use the service due to good condition. Four interviewees described how they did not see advantages of using the service because they were feeling good, had no adverse effects, or had only minor, explicit adverse effects.

*“But then I told my nurse that I answer the same things every time. I put there the exact same every single time. No constipation, I haven’t vomited, I feel good, I have no pain [...] so I don’t see it that way, you know. It can be like, what again, I still don’t have anything.” [11:20]*

Linked with good condition, one patient (#id 3) described that frequency of appointments was adequate for reporting symptoms. Like the patients who brought up lack of interest due to good condition, this patient also pointed out that she did not experience any severe adverse effects.

*“I don’t at least feel, really, that I would be missing out [...] for example there are such neuropathy symptoms that these can, just these treatments can cause [...] So there is such a form about them, such that is suitable for older people like this. [...] But that I haven’t had that then, haven’t had these neuropathy symptoms.” [3:36]*

Facilitating aspects in this category were linked to potential use of the service in case of adverse effects that the patient interpreted as unclear or needing possible medical attention.

*“[...] if I had felt such vague symptoms, such that would have made me wonder what they are about [...] that at least some kind of doubt would have arisen that what if this, what if this is a sign of something bad [...] that could they be connected to this so in that case I would have, I would have well, it would have actually been quite the best method this because I could have quite lengthily explain [...] what kind of symptoms and feelings I have now.” [6:50]*

#### **4.1.3 Factors Related to IT**

The category of IT related factors includes aspects about the patients’ general IT skills and usage. As can be seen in table 4.1, IT related aspects were more often brought up as factors that hinder the use of Kaiku compared to facilitative factors. Nine out of twelve interviewees mentioned at least one IT related factor. Four of these were active users, five

belonged to the no use group. In order to provide a general picture on the interviewees' outlook on IT, table 4.2 presents an overview on the interviewees' IT usage and how they subjectively described their IT skills. Like can be detected from the table, most interviewees in the user group expressed confidence, while most members of the non-user group expressed anxiety with IT.

*Table 4.2: The interviewees' IT use and subjective touch on their IT skills.*

<b>ID (group)</b>	<b>IT use</b>	<b>Subjective IT skills</b>
1 (user)	Used IT at work, uses it actively in free time	Confident user
2 (non-user)	Used IT at work, uses occasionally in free time	Uncertain user
3 (non-user)	No IT use	Anxiety towards IT
4 (user)	Uses IT at work and in free time	Confident user as long as tasks remain simple, describes some frustration with IT
5 (user)	Uses IT at work and in free time	Confident user
6 (non-user)	Used IT at work, uses occasionally in free time	Uncertain user
7 (non-user)	Used IT a little at work, uses a little in free time	Uncertain user, confidence in the simplest tasks, limited interest towards IT
8 (non-user)	Uses IT a little in free time	Uncertain user, limited interest towards IT
9 (user)	Uses IT in free time	Confident user
10 (user)	Uses IT in free time	Uncertain user
11 (user)	Uses IT at work and in free time	Confident user
12 (user)	Uses IT at work and in free time	Confident user

The most prevalent hindrance related to IT was little or no use of IT in general, which was mentioned by four patients. Each of these patients belonged to the group of non-users. The activity of these interviewees' IT use ranged from absolutely no use at all to somewhat uncertain but yet almost daily use.

*"I don't have the Internet at all. I have said that as long as it's possible I have to resist [it]." [3:59]*

In addition, one of the active users also brought up assumed little use of IT as a hindrance.

*"[#11] [...] I just think that if you are older and if you have, I should think you grab the phone before you open any application [...]" [11:54]*

Together with modest IT use, lack of interest towards IT also occurred as a hindrance for adoption and acceptance. In other words, it seemed that sufficient skills to use IT are merely not enough to boost acceptance, especially if the user is, to some degree, uncertain with his or her skills.

*"I'm not an opponent of IT. It's a fine thing, really. That I could see there how I am doing. But I don't see it as a marvelous thing, in a sense that if one does not otherwise know how he is, should he really need to look it up there, either." [7:52]*

Accessibility of IT support from one's immediate circle was brought up both as a facilitator and as a hindrance. Namely, easily accessible support was detected as an encouraging factor (see quote 5:5) and far away residing support as a hindrance (see quote 3:48).

*"If one really had, but they all live so far away, the young, you can't really [...] you can't really reach them, well my husband is even a bit older than I am so that he, he is not used to [...] he can't help [...]" [3:48]*

*"[#5] And if there is a problem, one can always ask the younger generation.*

*[Int] Right*

*[#5] We have a field's doctor, this nerd doctor [...] so it's easy to ask, then." [5:5]*

Finally, confidence in personal IT skills came up as a facilitator for acceptance. It was brought up as own perceptions of one's own skills (see quote 5:32) and as assumed confidence as a booster for use. Moreover, two patients also pointed out how medical professionals indicated confidence in the patient's IT use while presenting the service,

i.e. pointed out that it would be easy for the patient to use the service as they possess sufficient IT skills in general (see quote 2:12).

*“The Kaiku was visible there, and like maybe I, like I became aware of it unprompted quite quickly. And maybe I then let them understand that I already know how to do this. [...]” [5:32]*

*“Well, the doctor [...] just said that why, you use the computer, you could come along with this type of [...] and I promised to it then [...]” [2:12]*

In addition to confidence related comments that were directly linked to adoption and acceptance, it is noteworthy that only one patient (id #10) in the active user group indicated evident uncertainty with her capabilities with IT and even she mentioned daily check-ups of news sites and Facebook (see table 4.2). In other words, it is possible that confidence in IT skills is a more important facilitator than explicitly stated in the comments of the patients.

#### **4.1.4 Factors Related to Kaiku**

The category of factors related to Kaiku includes aspects that were directly connected to the idea, implementation, and performance of the service. Unlike the previous categories, facilitators for the use were emphasized among the factors that related to the service itself (see table 4.1). Ten out of twelve patients discussed this type of factors. The two patients (ids #3 and #8) who did not bring up any factors within this category had never tried the use of the service. One patient (id #7) who had not tried Kaiku’s use, however, provided two comments to this category.

The most recurrent aspect in this category was perceived ease of use. It was primarily connected to have a facilitating effect (n=25), i.e. the interviewees expressed a high level of perceived easiness. In addition to simply describing the service as easy, perceived ease of use appeared as comments on lack of problems, fast or effortless use (see quote 12:28), proper amount of questions (in the PRO questionnaires), resemblance with other digital services (especially when talking about signing in), understandable language in the service, and good functionality on different devices.

*“[...] [#12] of course the easiness and the effortlessness in a sense that you can like put a matter in hand with a few sentences, on the spot.*

*[Int] Yes.*

*[#12] I think it's like also at work we have, what is easy and effortless so that is good."*

*[12:28]*

However, in two quotations a lower level of perceived ease of use was expressed, and these were counted as hindrances. One of these considered the PRO questionnaires too long, and the other described confusion in answering two different PRO questionnaires. She explained that the questionnaires included partly same questions but had somewhat different perspectives. Hence, the almost same question required different answers (yes/no) in different questionnaires in order to maintain the same meaning.

Other than perceived use, the category consisted of nearly as many facilitators and hindrances. Facilitators in this category included perceiving the idea of Kaiku good or interesting, positive views on Kaiku's performance or functionalities (see quote 11:50), connection between Kaiku and personal health (see quote 4:43), viewing potential to develop Kaiku further, trust in privacy and security, and easily available technical support (to renew password).

*"[#4] If it was someone else's topic [...] that it wouldn't be connected to my health which is in a way like personal, I wouldn't answer.*

*[Int] Mm.*

*[#4] But when it is in this sense personal ja then it is a direct connection, I believe, the belief at least is that it has a direct connection with my health. [...]" [4:43]*

*"it has worked really well in my opinion [...], like either you have a computer, a tablet, or a phone, that you always have one of them right there." [11:50]*

Hindrances that related to Kaiku comprised lack of relevance of Kaiku's functionalities for personal situation, expressed disappointment with the service, lack of clarity of the service (see quote 10:46), viewing Kaiku as separate from medical professionals (see quote 7:55), and lack of interest or excitement towards the service.

*"[#7] But I am being taken care of there.*

*[Int] Right.*

*[#7] And it is the people that take care there, not Kaiku" [7:55]*

*"[#10] And then if you put there that, that somehow that now so then I think it is like always.*

*[Int] Yes.*

[#10] *And it can be only today, the tired day.*

[Int] *Yes. So it doesn't like consider the time period in the same way?*

[#10] *Yes. And then the next questionnaire might come after a month.*" [10:46]

#### **4.1.5 Other Facilitators or Hindrances**

This category aggregates facilitators and hindrances that could not clearly be categorized into the other categories. The hindrances in this category outnumbered the facilitators markedly. Seven out of twelve interviewees stated at least one of this type of factors, three belonging to the group of active users and four to the non-users.

Personal characteristics and attitudes were detected both as facilitators and hindrances. These related to capabilities of interaction (see quote 4:50), communication, and initiative taking, as well as to patience while performing tasks. Also, situational ability to internalize information when Kaiku was presented was brought up from a hindering point of view.

*"really I am of course that kind that I am not, I find it easy to contact, I don't find it difficult, basically, that do I dare to call."* [4:50]

In addition to the above mentioned, one interviewee (id #7) expressed concerns about own possible behavior with the service, describing that he was afraid of becoming a burden to the medical professionals throughout asking vain questions or sending unnecessary complaints about his condition.

Two patients (ids #2 and #6) in the non-user group described forgetting about the possibility of the service after a while after the presentation. In addition, one patient (id #8) did not at first recall being presented with the service. This was considered as a hindrance, since it implicated that even if these patients would have had a need for the service later during their experience, they would not have been able to utilize it. Other hindrances in this category included lack of interest to actively follow one's own health, lack of perceived effect to one's life and other hastes in life decreasing motivation to use the service (see quote 11:48). The latter, however, was linked to good condition which reduced the usefulness of the service according to this patient.

*"[#11] [...] probably that when I was busy at work and then I answered like, that bugger, this came again. Because I don't have anything.*

*[Int] Yes.*

*[“11] So it probably was just that well, hmph, why again.” [11:48]*

Finally, peer support activities came up as a hindrance for the service. The interviewee who pointed this out (id #8) indicated that he perceived that the peer support group offered him everything that he could need from this type of a service.

## **4.2 Effects on Patient Experience**

In order to observe Kaiku's effects on patient experience, it was first examined what kind of themes were present in the data that related to patient experience. Thereafter, it was considered how the patients described Kaiku affecting the experience.

### **4.2.1 Patient Experience Themes**

After initial coding of the data, it seemed that the codes related to patient experience fitted quite well to the themes provided in the Warwick Patient Experience Framework (Staniszewska et al., 2014). However, slight adjustments were made to the framework's themes in order to achieve a more exhaustive grasp of the data in the present study and to better include the themes pointed out by Wolf et al. (2014). The themes that were detected from the data are presented in table 4.3. As can be noticed in the table, some themes of Wolf et al. (2014) were related to more than one of the established themes. The table also shows the number of total occurrences in the data. Six out of the seven themes were mentioned at least once by each interviewee. The theme of active participation was left unmentioned by one of the interviewed patients (id #2). More comprehensive lists of the results about patient experience can be found in appendix 3.

The data showed no clear differences in the patients' descriptions on their experiences. Naturally, the patients in the group of active users discussed the patient experience themes also from the perspective of Kaiku, but on a general level the patients in the different groups did not consistently approach any of the themes from clearly different perspectives. Still, among the user group, the use of Kaiku was described to have several effects linked with patient experience, which are discussed in the next subchapter.

*Table 4.3: Patient experience themes detected from the data.*

<b>Theme</b>	<b>Themes</b>	<b>Description</b>	<b>Count</b>
Lived experience and perceptions	WaPEF: lived experience Wolf et al: patient perceptions, integrated nature	Encompasses extension of the experience also to broader life context, acknowledgement of patient's personal perceptions of different aspects that affect the experience	136
Communication	WaPEF: communication Wolf et al: person-centeredness	Encompasses individual needs for communication (including style and reciprocity), demonstration of adequate expertise and empathy	84
Responsiveness and individualization	WaPEF: responsiveness of services – an individualized approach Wolf et al: person-centeredness	Encompasses tailoring care to meet individual needs and expectations and patient's assessment of performance of services, providing care according to patient-centered principles, seeing the patient as a person	83
Information	WaPEF: information Wolf et al: person-centeredness	Encompasses enabling sufficient and easily accessible quality information for the patient (especially to involve in decisions and to support self-care), recognizing different needs for information	65
Continuity and integration	WaPEF: continuity of care and relationships Wolf et al: sum of all interactions, integrated nature, continuum of care	Encompasses the dynamic and continuous nature as well as extensiveness of the patient's experience, the importance of longstanding relationships with health care professionals and accessibility of services, trust	60
Support	WaPEF: support Wolf et al: patient and family partnership	Encompasses patient's needs and wishes for support, enabling active involvement of patient's family etc. (in case the patient so desires)	49
Active participation	WaPEF: patient as active participant Wolf et al: patient and family partnership	Encompasses patient's active role in self-care, management of own health, and decision-making relating to their care	27



#### 4.2.2 Kaiku and Patient Experience

Two use-cases of Kaiku were consistently and close to equal frequency brought up in the interviews: communicating with the medical professionals with low effort and providing patient-reported outcomes through the questionnaires in the service. The interviewees of the study described both existing ( $n = 49$ ) and potential effects ( $n = 44$ ) that Kaiku can have on patient experience. These were categorized according to the patient's own experience, i.e. the existing effects include only effects that the patients explained to have experienced themselves. In other words, the potential effects include both effects that already could be achieved with the service but were not utilized by the interviewee and effects that would require implementation of new functionalities to the service. There were distinct differences in how these effects distributed between the patient experience themes. Not surprisingly, considering the functionalities of the service, communication, continuity and integration, and information were the themes that were most repeatedly connected to Kaiku. Figure 4.1 shows the distribution across different themes. It should be noted, that some effects were categorized under more than one patient experience theme, which explains why the sum of the effects in figure 4.1 exceed the amount of found effects.

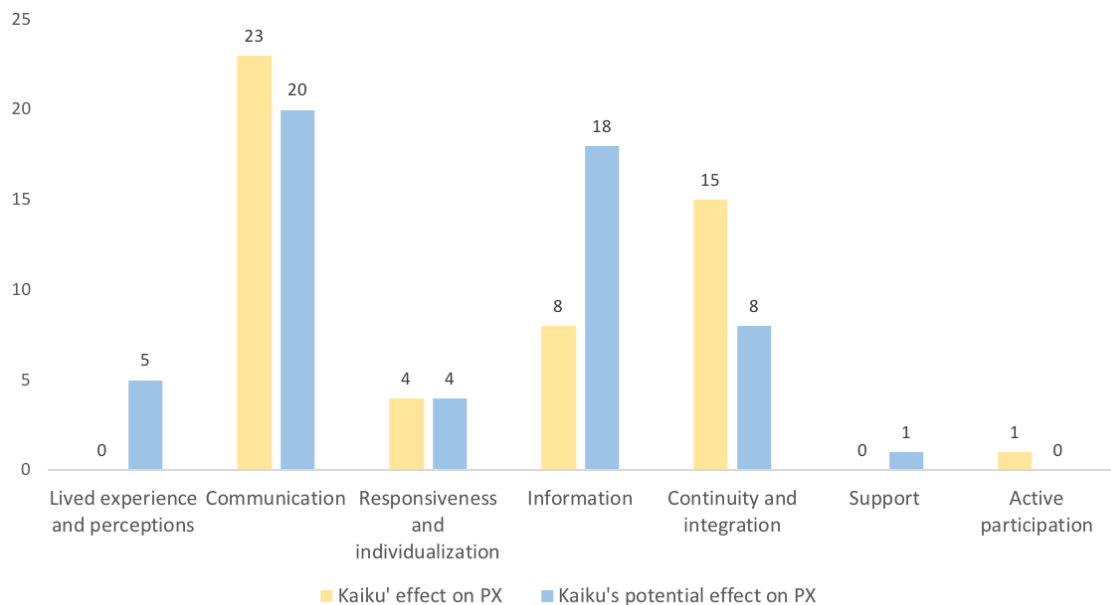


Figure 4.1: The effects and potential effects of Kaiku on patient experience.

The effects of Kaiku are first discussed in the following from the viewpoint of the two use-cases. After that, such effects that were not unambiguously linked with one of the use-cases and effects that were related to ideas of new functionalities are presented. Both use-cases were noted to influence several themes of patient experience. As could be expected, they seemed to have somewhat different types of effects to different aspects of the experience. Most of the effects, both current and potential, described were positive in nature, i.e. the patients viewed using Kaiku to enhance their experience. However, a few negative comments were given about the effects (n = 4) and the potential effects (n = 5) of the service.

The possibility to communicate with medical professionals through the service was described to affect patient experience especially within the theme of communication. This use-case of the service was perceived as lowering both the threshold and effort of communication as well as speeding up the rate of it (see quote 11:21). Each of these aspects was depicted to have a positive effect on patient experience. Enhanced communication also was perceived to result to better information flow between the patient and the medical professionals. Indeed, the communication opportunity was used, among others, to clarify and specify information that had been given orally at appointments. Improved communication and information were explained to add feelings of safety and relief (see quote 1:114). Moreover, this use-case of the service made the medical professionals seem more accessible (see quote 5:34), and this was indicated to, among others, diminish the patients' uncertainties as they did not have to wait for an appointment to be able to contact the medical staff. In other words, the service was seen to advance experience within continuity and integration.

*“[#1] [...] But it is a kind of feeling of safety and feeling of relief.*

*[Int] Yes.*

*[#1] And then one can be more freely on one's own, that I don't have to be nervous about certain things, when I can ask about them. Think already here that if something comes up I can ask there and tell them.” [1:114]*

*“[...] [Int] what seemed particularly useful in the service?*

*[#5] That, that well I get to these, I can like impose it that in a specialist organization, I have the disease 24 hours, and they typically work 8 hours. So I could count right away what that means.” [5:34]*

*“[#11] But it is tremendously good like for example now my nurse forgot to tell me that I need to put leukocyte injections for myself. So she messaged me about that through that way then.*

*[Int] Right.*

*[#11] It is, like, it works just like this. That I get like.” [11:21]*

Potential effects of the communication use-case included the same kind of effects as described above, only repeated by patients who described possible effects in situations they had not experienced themselves. For example, one interviewee (id #9) had not had Kaiku in use when she had experienced some unpleasant adverse effects and stated that in such situation she thought the service would have been more useful to her than now because she would have had a channel to ask what she should do. In addition, one patient (id #7) talked about being afraid of becoming a burden throughout sending pointless questions. This was one of the only effects that was discussed from a negative perspective.

The PRO questionnaires were described to provide a continuous contact between the medical professionals and the patient, which was perceived as adding continuity to the care (see quote 4:46). The PROs were also considered to improve communication and information because they were seen to enable faster and more accurate descriptions on one's own situation (see quote 11:24). In addition, the provision of information was considered to make appointments more efficient and pleasant (see quote 12:39). Implicitly, active filling of the questionnaires seemed to be considered as a way to actively participate in one's care. Connected with active participation, one patient (id #1) described how she perceived using the service as a channel to record her own history, which she thought was good because it later helped to remember different phases.

*“There is, it is good in that then there are the ones who, like who according to my understanding then read, or the nurse [...] that she goes through it. That I have gotten such a picture that they have looked through it.” [4:46]*

*“But that, I think, like I said straight away that it's an excellent invention. [...] And then you can see there and everyone, the doctors can see and the nurses can see there right away [...] that if I would be feeling bad, [...]” [11:24]*

*“[...] and then even when you go there for an appointment you don't have to fill out anything there or jump from one room to another. [...] you sign up and wait, go to the doctor and go home. Everything else comes from the tablet. I think it's a great system. [...]” [12:39]*

Potential effects of the PROs included improvement in responsiveness and individualization in cases in which the patient would receive personal reactions from medical professionals after filling out the questionnaire. Furthermore, the lack of reactions or late reactions were perceived to have a potential negative effect on patient experience because they raise feelings of lesser importance. (see quote 4:101) At the same time, increase in responsiveness to adverse effects was described possible with the help of PROs. Additionally, the PROs were potentially seen as increasing continuity with the care which added to perceived safety.

*“[...] I would wish that when I answer the questionnaire, so I would receive this kind of a response then that nice to hear. And within a reasonable time. [...] and if it comes after weeks, then it’s the same as that it wouldn’t come at all. Because then it gives an impression that oh, now you had the time.” [4:101]*

There were also negative effects that were described by the interviewees related to the use-case of PRO questionnaires. One interviewee (id #10) talked about a situation in which she had expressed worrying adverse effects through Kaiku and had not received any reactions from the medical staff. This had increased her sense of frustration and lack of trust towards the service. Another interviewee (id #5) pointed out negative feelings that had been arisen by the irrelevance of the questions in the PRO questionnaires and by their inappropriateness compared to the phase of the treatment. He considered the service to have great potential but expressed clear disappointment with the execution.

*“why, I am not afraid of blood but I mean that after this when I go home and then I start to fill it. [...] it’s like childish, the system. It is an excellent tool, but they should absolutely like from the treatment path [...] because it cannibalizes the entire thing. That if I was a more sensitive guy, I would have said that keep your damn jack, one doesn’t even be bothered to answer these kinds of questions” [5:110]*

Several effects and potential effects were also brought up relating generally to the service. These effects were similar to the effects that were linked with a specific use-case. They included enhancement of accessibility of medical professionals which was perceived as easier communication and increased feelings of being taken care of. The service was described to work as an informative and reassuring tool, which could be interpreted to improve the experience from the perspective of information theme. In like manner, general potential effects of the service that were connected to the service as such repeated

the same effects as the ones linked with the use-cases. Although, this category also included three potential negative effects. Two of these related to bringing the cancer too much into one's everyday life (see quote 7:61). One interviewee (id #10) considered that adding communication through the internet raises contradictory feelings because of the importance of face to face communication between physician and patient.

*"[...] [#7] So there is always the certain tension that arises when the control day approaches, but the I practically forget the whole thing.*

*[Int] Yes.*

*[#7] That I, like I don't really even want to think about it before the next control week."*

*[7:61]*

Then again, various potential effects were also described joined up with new functionalities. These related predominantly to different kinds of informational aspects. First of all, the service was perceived as a potential source of information about the treatments. It was pointed out that the internet is filled with information on the treatments but if links to reliable sources were provided through Kaiku the medical professionals could control how the patient prepares for the treatments and what kind of information he looks up. Besides, it would be easier for the patients because they would not have to search for information themselves or debate about the reliability of the sources. Another new functionality was integration with the clinic's system so that own personal patient record could be viewed from the service (see quote 5:60). One patient (id #12) thought that it would be great to receive reminders about the appointments through the service. Another interviewee (id #10) hoped that it would be possible to write with own words about her daily condition in such manner that the date would be saved with the description so that the doctor could easily see when and what the patient has experienced. In addition to the theme of information, these functionalities could be interpreted to improve continuity.

*"[...] [#5] So a documentation about them would be nice to have in Kaiku as well. [...] I remember it now because I have the documents. [...] I would find it really nice because if I go after a year I won't find them anymore.*

*[Int] Right.*

*[#5] But there in Kaiku they could be [...] Practically, that there would be the patient record." [5:60]*

Finally, the service was seen potential to provide support and understanding on the cancer's more general effects on life (see quote 4:96), i.e. have an effect on lived experience and perceptions. Connected to this, it was brought up that the partner of the patient could also be a user of the service and that they could even provide their own answers on certain aspects about adverse effects and such. In addition, the service could be a channel to provide information on expected effects and increase mutual understanding about the situation. It was also suggested that the service could include a frequently asked questions section and information about other general practicalities related to treatments, for example billing information.

*“this cancer is one part of a complete life, that it affects everything. So it could definitely have this kind of general longer timeline [...] knowledge on how it otherwise, like, has affected life, how one's relationship, how one's work, has it restricted some work things.” [4:96]*

## **5 Discussion and Conclusions**

In this chapter, the findings of the study are further discussed. First, answers are provided to the research questions based on the results of this study. Then, some theoretical and practical implications derived based on these results are presented. Thereafter, the limitations of this study are considered and future research topics that appeared based on the present research. Finally, the conclusions of this research are discussed.

### **5.1 Answers to the Research Questions**

This chapter presents answers the study brought to the research questions. Here, the results of the empirical research are drawn together with previous literature.

#### **5.1.1 Facilitators and hindrances for technology acceptance**

The first research question asked about facilitating and hindering factors for adoption and acceptance of technology. More specifically, in this study the adoption and acceptance of a digital service for cancer patients was investigated. Like presented in chapter 4, the aspects that arose in the study could be dealt in five categories: care/treatment related, condition related, IT related, Kaiku related, and other. Out of these, the categories related to Kaiku and to care or treatment were distinctively the most prevalent.

The findings are similar to previous findings of research on other health related services. For example, DuBenske et al. (2010) listed both lack of IT experience as well as lack of belief of further advantages as reasons to decline from a study that investigated an interactive health communication system. In the present research, each member of the non-user groups mentioned uncertainties with their IT skills, even though four out of five did use IT in such manner that they most likely would have had the capabilities required for this type of a service. It is also worth to notice that even though there were few IT related facilitators, it is likely that confident IT users do not even think about mentioning their IT use as a facilitator. In other words, the significance of confident or uncertain general use of IT is likely to have an even bigger influence than suggested by the results. Like in the study by Hassol et al. (2004), the patients in this research showed no doubts about privacy or confidentiality regarding the use of Kaiku. Albeit, it should be noted that

the participants in the present study were all quite upfront and out-going about their situation, which might affect perceptions about security needs as well.

Interestingly, many factors in the Kaiku related category can be connected with user experience. For example, perceived ease of use, lack of clarity of the service, availability of technical support, and positive comments on Kaiku's performance can each be viewed as describing user experience of the service. Correspondingly, many factors in the care/treatment related category can be connected with the themes associated with patient experience. To name a few, the preference or confidence for traditional communication methods links with the themes of communication, information, and responsiveness and individualization as the patients praised that they were given the possibility to traditional forms of communication. Likewise, preference to use Kaiku as a way for communication connects with the same themes. Bringing the medical professionals closer or more accessible can be associated with communication, continuity and integration, and support. Needing acute medical attention can be related to lived experience and perceptions, communication, information, and responsiveness and individualization.

In addition to the abovementioned connections, even the other two defined categories, i.e. IT and condition related factors, have associations with user experience and patient experience, respectively. General IT skills can have a leading effect on user experience, as a confident IT user is likely to require different things from a service than an uncertain user. And quite naturally, the way one perceives his/her condition is likely to influence his/her comprehensive experience. To sum up, adoption and acceptance seemed to be affected most frequently by factors that also relate to either user experience or patient experience. In other words, the results of the present study indicate that both user experience and patient experience can act as predictors for adoption and acceptance.

Many factors within the Kaiku, care/treatment, and condition related categories as well as the "other" category were attached with perceived usefulness. For example, the patients brought up relevance of the service from many different viewpoints, e.g. linked with their condition or with their needs to communicate, as well as perceived relevance to the medical professionals. Perceived usefulness was related with different factors about communication as well: one of the major hindrances for the acceptance of the service was the lack of need to communicate with the medical professionals in between the



appointments or lack of additional benefit to the communication compared to for example phone calls. On the other hand, the patients who had utilized Kaiku's communication possibilities described them as particularly efficient and useful. Based on previous literature on adoption and acceptance this result is not surprising. Research on TAM has consistently demonstrated the significance of perceived usefulness as a predictor for behavioral intention (Lee et al., 2003), so from this perspective cancer patients' acceptance of digital services is coherent with research from other contexts.

Perceived ease of use was also present in the data. First of all, the interviewees described Kaiku's use directly as easy in several occasions. Second of all, the category of IT related factors influencing adoption or acceptance of the service can be paralleled with perceived ease of use. In other words, indicated confidence with IT skills can be linked with high perceived ease of use of this type of a service. Similarly, uncertainty with general IT skills are likely to be connected with low perceived ease of use. In conclusion, the category of IT related factors can be linked with HIT self-efficacy meanwhile many Kaiku related factors can be associated with HIT reliability, i.e. the two antecedents of perceived ease of use and usefulness in HITAM (Kim and Park, 2012).

Along with the two original TAM constructs, perceived threat, the third proposed construct of HITAM, was also detectable from the data. Especially the category of factors that related to condition pointed out to this construct. When condition was perceived good, the perceived usefulness of the service decreased, as would be expected by HITAM. Additionally, the model's suggestion of subjective norm as an antecedent of perceived usefulness was shown in the data as the interviewees described obligation towards or assumed relevance for medical professionals as a facilitator for acceptance. In summary, the findings of the empirical study seem to support HITAM. However, its explanatory capabilities might not be exhaustive. Specifically, it seems to be important to accumulate understanding on how different aspects of patient experience affect the construction of perceived usefulness, ease of use, and threat.

The present study did not find clear differences between adoption and acceptance, mostly due to the fact that one of the planned subgroups was not realized (see chapter 3.2). However, two interviewees (ids #6 and #11) provided support for the assumption that perceived usefulness is more crucial for acceptance than perceived ease of use. Both of

these patients perceived the service as easy but claimed to stop using it due to lack of significance for their own situation.

### **5.1.2 Effects of a digital service on patient experience**

The second research question tackled the effects of a digital service on patient experience. The patient experience themes that appeared in the data were strongly correlated with previous literature on the subject, as only minor adjustments to WaPEF (Staniszewska et al., 2014) were necessary to appropriately fit the data. Kaiku's use seemed both to influence patient experience and also be affected by it. The use of Kaiku was most recurrently associated with the themes of communication, information, and continuity and integration. Out of these, communication accumulated almost equally realized and potential effects, continuity and integration collected mostly realized effects, while information gathered more of perceived potential effects. The effects of the use of Kaiku on patient experience were evidently more often described as positive than negative.

In order to achieve the effects, the user experience of the digital service should be considered. Based on the empirical findings of this study, user experience can influence the extent to which the possible effects on patient experience are realized. As discussed in chapter 2, user experience is a dynamic and subjective concept (Law et al., 2009). In a similar manner, the expectations and needs of the patient are subjective and dynamic. In cases in which the effort and benefit of the use of the service were in imbalance, i.e. user experience was decreased due to requirement of more effort in use than was perceived beneficial, the possible positive effects on patient experience did not occur. Then again, when there was a balance allowing a good user experience, it was more likely that the service's use promoted better patient experience. Moreover, user experience's dependence on the context (Law et al., 2009) and temporal nature (Karapanos et al., 2009) seemed to impact on how the use of a digital service can affect patient experience. In situations in which user experience was described bad because the use of the service did not meet the expectations of the patient in a specific setting, the interviewees of the present study pointed out even negative effects on patient experience. Simultaneously, a good user experience due to efficient use that fulfilled expectations was linked with positive effects. To sum up, acknowledging different aspects of and aiming at a fluent

user experience can promote the capability of digital services to have positive effects on patient experience.

The effects described by the interviewees of the present study correlate with previous research. A few examples are depicted here. According to Hassol et al. (2004), the preferred means of communication was different in different situation. In like manner, the interviewees brought up several times that they would choose calling if they needed urgent advices and using Kaiku if they did not require an answer immediately. The interviewees also considered the potential of Kaiku to enhance efficiency of doctors' appointments, and in like manner, the summary care records' potential to reduce needs to fill out physical forms and to remember medication lists arose as one of the most often mentioned benefits of such a service (Greenhalgh et al., 2008). Then again, there were some contradictions as well. Many patients in this research yearned for reactions from the medical staff in the information they provided to the service. This is somewhat different to the results of Head et al. (2011), as in their study the patients were very satisfied with the technological intervention even though reactions from the medical professionals were required rather rarely.

Previous research has found connections between use of a digital service and positive outcomes. For example, Head and colleagues (2011) found significant relationships between amount of use of a telehealth intervention and scores on physical and emotional well-being and offered as an explanation that increased use resulted in better physical and emotional perceptions. However, it is possible that the relationship could be due to fact that people in better condition were readier to actively use the intervention. Several interviewees in the present study pointed out that they did not believe someone in a rather weak condition would have the energy or interest to fill out a symptom questionnaire. On the other hand, good condition lowered motivation to fill out PRO questionnaires, which is a similar finding with Liu et al. (2011) who discovered that lack of symptoms decreased the need for use of digital services especially in connection with substantial usability challenges. In the present study patient #11 ceased filling out the PRO questionnaires as she considered them overly time-consuming in contrast with the gained benefits. According to Liu et al., (2011) overcoming usability challenges requires a serious problem, i.e. calls for greater perceived usefulness for continuing use to seem worth it.

No distinctive differences were noted in descriptions of patient experience between the two subgroups, namely users and non-users, in the data of this study. This result can be interpreted in a number of ways. First of all, it is possible that satisfaction with care experience and relatively good condition combined diminish the need for a digital service, especially among older people. Four out of five patients in the non-user group described quite minor adverse effects, and all of them perceived the treatment they were receiving at the time as good. Another interpretation relates to age. The youngest person in the non-user group was 66 years old. It is possible that younger people might perceive digital health services useful more readily as digital services are generally more commonplace in their lives. Finally, it should be pointed that even though clear differences in descriptions of patient experience among the two different groups were detected, the user group described many effects on patient experience (see chapter 4.2), mostly in a positive sense. In other words, effects of a digital service on patient experience might be more fruitful to study by comparing the individuals' experience before and after using such a service.

Interestingly, both groups described Kaiku's potential effects on patient experience. Even the comments provided from the non-user groups were mostly positive. In other words, the patients seemed to consider such digital services generally as advantageous even if it would not answer their individual needs. However, in such situation the patient was likely to abandon or not initiate the use of the service. A good example on this is patient #7 who described the service as a great opportunity for others but thought that he had received such good care and information otherwise that did not see a need for the service for himself. In conclusion, a digital service such as Kaiku affected patient experience positively, but the lack of its use did not bring up negative consequences.

## **5.2 Theoretical Implications**

The empirical findings of this research provide possibilities to theoretical implications related both to acceptance theories and patient experience. Like mentioned previously in this chapter, the results were in line with previous research on TAM. Specifically, perceived usefulness and perceived ease of use predicted intention to use digital health services in cancer care in a similar manner as they have been shown to predict it in other contexts as well. Moreover, perceived usefulness came up more evidently and more

broadly across different types of factors as a predictor than perceived ease of use which is coherent with research in other contexts. Similarly, the interaction between the two constructs, i.e. perceived ease of use's indirect effect on intention to use via perceived usefulness was detectable from the data in the present study.

At the same time, the findings of this study indicate support for certain critiques towards TAM. For example, Benbasat and Barki (2007) argued that quite little of TAM research has aimed to find out how the basic constructs of the model are constructed. The empirical findings of the present study suggest that there is extensive variability in the antecedents of the constructs. Moreover, it is expressly the different kinds of antecedents that could be affected in order to promote adoption and acceptance. However, that would not be possible if only the existence of the basic constructs were examined. The findings of this study are clearly linked to the specific context of cancer patients and cancer care, but it could be noteworthy to consider whether some generalizable antecedents could be constructed based on them. Another observation indicates that the critique on TAM about often using intention to use instead of objectively measured use (Lee et al., 2003) might indeed affect the results. Namely, conflicts between subjective description and actual use of the service were detectable among two interviewees of the present study: one described active use but stated that she had stopped using the service, another discussed enthusiastically about the possibility to use the service but at least previously had not actually started to use it. To put it differently, it is possible that people's intention to use or self-measured use lack in correlation with actual use, and therefore using intention to use so extensively in adoption studies can lead to distorted or overly simplified results.

The empirical findings also give space to consider whether the adoption and acceptance models acknowledge a sufficient timespan in order to enable thorough understanding. Many of the models do not really distinguish between adoption and acceptance, so they are used overlappingly in studies examining adoption and in studies examining acceptance (as defined in the present study, see chapter 2.1). However, it is possible that there are different underlying factors behind these two phases of use. The findings of the present study not only indicate that different times, and therefore varying contexts, of use have changing expectations and needs, but also provide an actual example of adoption not leading to acceptance in one of the interviewees (discussed further in chapter 5.4). In

a sense, the temporal framework for user experience (Karapanos et al., 2009) can be viewed to be linked with temporality of adoption and acceptance as well. Nonetheless, changes in user experience alone are not likely to cover differences between adoption and acceptance exhaustively. TAM2, TAM3 and UTAUT take initial steps towards accounting of the temporal aspect towards adoption and acceptance, but further research and theorizing could be beneficial.

On the other hand, the results supported the extension of TAM proposed by Kim and Park (2012) as discussed previously in this chapter. In short, the results supported both the suggested antecedents as well as the added mediating construct of perceived threat. The extended model theorizes perceived threat to affect via perceived usefulness. This could be seen from the data especially in the form of condition related factors: when personal condition, i.e. health status, was good, the use of the digital service lacked perceived usefulness among the interviewees. Nonetheless, all the factors that were brought up in the present study could not be explained with the help of HITAM. For instance, many factors within the care related category do not fit any of the model's antecedents even though they could be interpreted to affect e.g. perceived usefulness. In conclusion, HITAM seems to be a good start for explaining acceptance within health care but should be elaborated further, perhaps with more focus on different aspects of patient experience.

Like discussed above, the findings on patient experience on the present study were coherent with previous literature on patient experience. In other words, the findings indicate that the themes discussed by Wolf et al. (2014) and the framework by Staniszewska et al. (2014) encompass quite extensively different aspects of patient experience. The theoretical approaches towards patient experience have investigated different kinds of illness processes. However, it remains untouched by the theories if different illnesses have different emphases on different themes. Furthermore, individual preferences of the importance of specific themes are not considered in patient experience theories. Individual needs and situations were evident in the empirical findings of the present study. Patient perceptions and individualization are considered also in patient experience literature. Therefore, if the relative importance of the different themes could be measured, it might enable more effective and accurate customization of services to

enhance patient experience. Development of such measures could thus be an area for future research.

As hypothesized when discussing the theoretical background in chapter 2, the empirical findings pointed out to the interaction of user experience and patient experience. The interaction between these concepts seemed reciprocal based on the results. First of all, patient experience affected the expectations and needs of the service which then again affected user experience based on how the service met these needs and expectations. Second of all, user experience of the service affected patient experience. For instance, when using the service was perceived fluent and easy, there occurred positive effects on patient experience. However, further examination on these interactions is required to enhance understanding on them. While digital services for patients are becoming more common, it is essential to develop the theoretical links between patient experience and information system literature.

### **5.3 Practical Implications**

Based on the results of this research, following practical implications could be beneficial. First of all, to promote adoption of the service, it should be considered to demonstrate its use at the reception. Out of the interviewed patients of the present study, one had received a step-by-step presentation of the service and he praised it. Then again, further training at the reception is time-consuming. It produces additional costs, and the most optimal amount of training compared to maximization of informational health systems' benefits is undefined (DuBenske et al., 2010). In other words, the needs for the presentation should be considered individually in order to achieve optimal balance between effort and results. On the other hand, more thorough presentation can also be executed in a less consuming way. Providing patients with an informational video on Internet-based psychological pain intervention as a facilitator for acceptance not only increased acceptance, but also had a positive impact on the key predictors of it (Baumeister et al., 2015). This kind of a video can be, for example, running on tv screen at the reception (Baumeister et al., 2015) or be sent to the patients via e-mail after discussing the possibility of the service face to face.

Another observation was connected to how often Kaiku was brought up by medical professionals for the patients who did not initiate use after presentation. One of the

patients (id #2) stated that she was told about the service once and one of the patients (id #8) did not recall the presentation of the service by the medical professionals at first but had the impression he had only heard about it from a peer support person. Both of these patients used the internet at home, i.e. could have been potential users. Especially the case of interviewee #2, who stated that her weakened condition was the main reason for her lack of use, implies that it could be useful that medical professionals would talk about the possibility of the service at least a couple of times. Of course, if the patients clearly indicate that they are not interested of the service, it should not be imposed.

In previous literature, there has been some indications to add access to personal digital health services to certain other people, such as the spouse or children, in addition to the patient themselves. In the interviews of the present research, nine out of twelve patients described the importance of support they received from their significant other. This is in line with earlier research, as for example Keselman et al. (2007) found that over half of the respondents in their study showed their medical record to their family and over 70 % discussed the record with family members. Furthermore, Hassol et al. (2004) found that people sometimes use digital health services on behalf of their closed ones, which raises issues with confidentiality as it makes it uncertain who in fact is communicating through the service. However, there are situations in which the use of such services becomes too difficult for the patient and it is perceived easier to let someone else use it for oneself. In the results of this research, the reasons for lack of use of Kaiku included being elderly and uncertain with IT, complete lack of use of Internet, and lack of energy due to weak condition. Each of these reasons might be eluded by enabling user rights to a close one. Later on, the service (Hassol et al., 2004) investigated added a possibility to assign access rights to family members, and such features have also been realized in personal health records targeted to consumers (Liu et al., 2011). This could be a possibility also to Kaiku, especially because of the characteristics of cancer treatments that can cause severe adverse effects and because of the relatively old age of a large portion of cancer patients. In addition, this could open up possibilities to enhance experienced support and involvement of the family members. In fact, one of the interviewees of the present study even suggested that he would consider beneficial if his wife would be able to fill out questionnaires about his condition through her own perspective.



Several interviewees of the present study wished for integration of health records to the service, for instance information on previous appointments and treatments, and reminders on future appointments. Similar findings have been noted before as well. For example, DuBenske et al. (2010) found integration with existing medical systems as a critical matter for implementation of interactive health communication systems. At the same time, it is important to ensure sufficient simplicity. Too broad functionality and information content has been considered as potential problems for adoption of digital health services (Liu et al., 2011). Integration with the clinics' existing systems might require further possibilities for individual customization in order to meet the needs of different patients.

The interviewees also brought up the possibility of using the service as an informational source. Among others, they described wanting to find information about the condition they had (e.g. prostate cancer), the treatments, as well as the supportive information about the effects on broader life context. These requests attain support from the literature. For instance, in the study by Duplaga (2013) educational resources were even more readily accepted that aspects that directly related to medical care. One of the interviewees in this study mentioned that if informational resources were provided through Kaiku, the medical professionals would be in better control of what the patient is watching. This can make a noteworthy difference because of the Internet's vast amount of both useful and inaccurate content. The internet has become one of the main sources for health-related information (Duplaga, 2013), and information seeking in the Internet has been found to have both positive and negative effects (Eysenbach, 2003). It could be both easier and safer for the patient if they are guided towards reliable sources of that information. Simultaneously, when adding such features careful consideration in order to maintain the service simple and targeted enough is important, because patients have been found to become frustrated when finding personally relevant information has been problematic (Nijland et al., 2008).

Finally, it is evident based on the results that the perceived benefit needs to be in balance with the perceived effort to encourage the use of a patient targeted digital service. One improvement could be, for instance, implementation of shortcuts in filling out the PRO questionnaires. One possibility would be that the service would take the last used

questionnaire as a model so that the patient would only need to modify the points that have changed since the last time. Another possibility could be that the patient could settle the questionnaire with one click indicating that nothing has changed. This way, the medical professionals would receive the important information that the patient is doing well without burdening the patient. Another remark relating to this is that it should be clearly indicated to the patient that the PRO questionnaires are relevant also for the medical professionals. Sensing a separation between Kaiku and the medical care team was acknowledged as a hindrance for the acceptance of the service while perceiving relevance for the medical team was considered as a facilitator in the present study.

Overall, when considering these suggestions, it is important to keep in mind that while aiming for sufficiently diverse functionality, it is also crucial to maintain appropriate simplicity. People have been found to propose new features and view extensive functionality as a problem in the same study investigating personal health records (Liu et al., 2011). A similar kind of effect can be present with the results of this study. Integration of new features can optimally enhance both user and patient experience, but also deteriorate them in case the service becomes too complex or is included with too many functionalities that are not relevant for the patient. Adding personal customization possibilities can be one way of defeating issues with complexity. For patients with simpler needs, additional features could be turned off.

#### **5.4 Limitations and Further Research**

This study has several limitations that should be acknowledged. First of all, the research was conducted among only one firm's customers. In addition, all the interviewees for this study were recruited in the domain of cancer patients and each interviewee was over 50 years old. In other words, the generalizability of the results remains uncertain. Nevertheless, the interviewees did represent different types of cancer and were in different stages of treatments. An additional limitation is the small sample size which is rather typical in qualitative research due to laborious analysis process. Even though this study altogether interviewed twelve patients, which can be perceived as an adequate sample size (see e.g. Guest et al., 2006), the subgroups only included five and seven patients. Due to this, thorough data saturation, especially in the non-user group, might not have been reached. Equally important, the study focused only on the patient perspective.

However, the medical professionals are of central importance for adoption and acceptance of this kind of services. Their viewpoint of acceptance of this kind of a service is an important future research topic.

Another limitation of this research, like with many other adoption and acceptance related research, was that actual usage was not measured. This means that the study utilized self-reported use when considering whether the interviewee had accepted Kaiku. Indeed, one of the interviewees (id #6) indicated clear behavioral intention to use the service at the time of the interview. However, he had not utilized the service before, and it remains uncertain whether his intention will ever turn into actual use. In addition, two (ids #2 and #6) out of five interviewees in the group of non-users described initial interest towards the service, i.e. initial intention to take up the use of it. These remarks point out to consideration whether intention to use actually correlates sufficiently with actual use.

A few limitations are connected with the data collection process. To begin with, the interview questions were aimed to be as open-ended as possible, but it is still possible that some of the questions directed the interviewees' answers. Moreover, it is possible that the interviewees' desire to please the interviewer affected their answers. Nonetheless, the interviewees provided also negative comments about the service and talked openly about their personal issues, so it is likely that their answers quite accurately represent their true opinions. Linked with the data analysis process, a limitation of this study is that only one researcher analyzed the data. In other words, the previous knowledge and perspectives of the researcher might have affected how the data was analyzed. To avoid this, the data was read through multiple times, and each time the researcher aimed to objectively analyze also the notes from previous rounds. Furthermore, it should be noted that the researcher had not previously been extensively engaged with the present theoretical concepts, i.e. did not have strong opinions about the relevant theories in advance.

A key limitation of this study was that the time of presentation of the service to the interviewees was not controlled. In other words, it varied rather much how well the interviewees remembered the presentation and the context in which they were at the time of the presentation. Still, the effect of the time of the presentation was brought up in several interviews (see chapter 4.1), for instance from the perspective of big emotional

variance and its influence in the ability to internalize information. It could be fruitful to study adoption and acceptance by selecting participants so that they would be interviewed rather shortly, for instance within a month, after the presentation of a service and then again after a longer period of time, e.g. six to twelve months after the presentation. This way, not only would it be possible to find crucial aspects about the presentation, it would also be possible to find differences between the factors for adoption and acceptance. In addition, it could be possible to control what the presentation includes (e.g. only oral presentation or going through the use together with the patient) and see how this affects adoption and acceptance.

Finally, eleven out of the twelve patients were in quite a good condition at the time of the interview. It is likely that a patient in good condition has different needs, capabilities, and expectations from a digital service than a patient whose condition is weak, so the results might not have captured complete versatility of the researched concepts. However, the care pathways of the patients were quite different, i.e. their experiences varied from one another which can have decreased the impact of this limitation, supposing that the interviewees could reflect accurately on their past experiences. Still, it could be advantageous to examine the researched matters with a greater variety of treatment phases and patients' condition.

The research points to other possibilities for further research as well. Related to the presentation of the service, it was brought up that the presenter can have a notable role in how the presentation is received by the patient. Therefore, it would be interesting to investigate what affects the nurses' attitudes and behavior during a presentation. For example, do the characteristics of the patient have an effect on how the service is presented? Can the presenter promote adoption by acknowledging the patients' individual needs? How much does other workload affect presentation of such a service? Another interesting topic for future research are motivational factors. Motivation has been found to have a significant impact on facilitating EHR implementation (McGinn et al., 2011) and in the present study some motivational factors were brought up by the interviewees. Future research could dig in to motivational theories and aim to find motivational matters that are especially relevant in the patient context.

The findings indicate that there are clear differences in which patient experience aspects are affected by such a service. Therefore, an interesting topic for future research is how the experience within the remaining themes could be affected. This way, the services could be constructed to more thoroughly address the variety of patient needs. Furthermore, it is important to examine how many themes are sensible to be targeted with one service. With too many purposes, the services easily become more complex and might fail to achieve sufficient perceived ease of use and perceived usefulness in order to promote acceptance when the relevant features for the individual are drowned in the excess of functionalities. In addition, it could be interesting to investigate if some themes are more significant for cancer patients than others. If so, digital services could better aim to have an effect in the most important aspects of patient experience, which could promote adoption of the services.

Due to limited schedule and resources combined with recruitment difficulties, one planned subgroup, the patients who tried the service, i.e. adopted it, but did not continue use, i.e. did not reach acceptance, was discarded from this study. However, this group could be extremely relevant for creating understanding of acceptance because they have demonstrated initial interest towards the service but for some reason this interest does not lead to accustomed use of the service. Consequently, it could be fruitful to investigate this group of patients even if reaching these patients can be laborious. In particular, this group is likely to include patients whose motivation to use the service can be affected. For instance, one (id #6) of the patients interviewed for this study had not actively used the service during or after his treatments but had activated his account after the interview invitation. During the interview, he expressed palpable interest towards the service and described potential future use:

*“That now I have a contact there... At the moment, and we’ll see then, if I’ll have a need to contact, and now of course I can contact them even with a more minor issue.” [6:16]*

The relationship between patient experience, user experience, and adoption or acceptance is also an interesting future research topic. The results from the present study point out to clear connections between the concepts, and therefore gaining a better understanding of their relations in this specific context could enable better design of digital health services.

## 5.5 Conclusions

The purpose of this study was to find factors affecting cancer patients' acceptance of a digital service that is provided for them by medical professional interrelated with their care. In addition, the study aimed to investigate how patient experience is affected by the use of the digital service. The study relied on literature of technology adoption and acceptance, such as technology acceptance model (Davis, 1989) and its extension to the health context (Kim and Park, 2012), user experience, and patient experience. An empirical study was conducted through thematic interviews with cancer patients ( $n = 12$ ) from three customer clinics of Kaiku Health. The collected qualitative data was analyzed according to thematic analysis method (Braun and Clarke, 2006).

The findings of the study indicate that acceptance of technology, user experience, and patient experience interact with each other. Behind adoption and acceptance, explaining factors were found in five categories: care, condition, the service itself, and IT related as well as other factors. The findings supported previous acceptance literature and particularly the extension of TAM by Kim and Park (2012). Still, the findings also suggested that the model is not entirely comprehensive as different aspects of patient experience seems to influence acceptance and the model does not consider them thoroughly. Specifically, care related factors and the temporal evolvement of the experience remain untouched by acceptance models. In addition, the effects of user experience might call for further emphasis. Indeed, digital services targeted for patients could benefit from more extensive user testing.

The themes regarding patient experience found in this research were consistent with previous research (Staniszewska et al., 2014; Wolf et al., 2014). The findings also supported interaction between patient experience and the use of digital services. Patient experience encompasses themes that can affect to the perceived usefulness of digital services. When a digital service is used in cancer care, it can influence patient experience in many aspects. The studied service was found to have most effects within the themes of communication, information, and continuity and integration. Although, the most relevant themes can fluctuate from one service to another. Based on the results, use of a digital service to communicate and to provide patient-reported outcomes mainly affects positively on patient experience. However, this requires that the service matches

individual needs of the patient, such as adjustment to the phase of the treatment. The findings also indicate that lack of use of a digital service is not likely to decrease patient experience if the lack of use depends on low perceived usefulness.

Several practical implications could be suggested based on the present study. Nevertheless, each of the implications might not be beneficial for every digital health service or even for every customer clinic of Kaiku. On the contrary, each added feature or reformed practice should be considered and evaluated from the perspective of each specific context in order to develop the services towards most optimal execution as the findings of this study point out to the importance of individual situations and needs that vary across contexts and time. In addition, the study pointed out many possible topics for future research that could enlighten the understanding on the subject even further. For instance, it could be beneficial to examine further how the presentation affects adoption and what affects how the medical professionals present the services to the patients.

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# APPENDICES

## Appendix 1 – Interview structure

The interviews were conducted in Finnish. Thus, the structure was constructed in Finnish as well. English translations are provided in parentheses as reference for English readers.

### 1 Taustatiedot (Background)

- Ikä? (Age?)
- Ammatti ja koulutus? (Occupation and education?)
- IT-taidot? (IT skills?)
- Asuminen ja perhe? (Habitation and family?)
  - Lähellä/kaukana hoitopaikkaan nähden? (Near/far from the treatment location?)
  - Yksin asuminen, puoliso, lapset? (Living alone, with spouse, children?)
- Muu terveydentila? (Other state of health?)
  - Krooniset sairaudet? (Chronical diseases?)

### 2 Syöpä ja arkielämä (Cancer and everyday life)

- Kertoisitko tarinanne sairauteen liittyen, aloittaen ensimmäisestä epäilystä tähän päivään? (Would you tell a story about the cancer, beginning from the very first suspicion and going on to this day?)
- Millaisia tunteita sairaus on herättänyt? Miten tunteet ovat muuttuneet matkan varrella? (What kind of feelings has the cancer provoked? How have the feelings changed along the way?)

### 3 Kaiku ja arkielämä (Kaiku and everyday life)

- Oletteko käyttäneet Kaikua? (Have you used Kaiku?)

#### 3.1 Kaikun esittely ja käyttöönotto (Kaiku's presentation and adoption)

- Miten kuulitte Kaikusta? (How did you hear about Kaiku?)  
*Tarvittaessa (if needed)*
  - Kuka palvelua esitteli? (Who presented the service?)
  - Oliko ajankohta sopiva/hyvä/huono? (How was the time of the presentation?)
  - Millaista materiaalia Kaikusta tarjottiin? (What kind of material was provided on Kaiku?)
- Millaisia ajatuksia Kaiku ensin herätti? (What kind of thoughts did Kaiku raise at first?)  
*Tarvittaessa (if needed)*
  - Jäikö esittelystä selkeä/ymmärrettävä kuva palvelusta? (Did the presentation give a clear/understandable comprehension on the service?)
  - Vaikuttiko palvelu esittelyn perusteella hyödylliseltä? Entä turvalliselta? (Did the service seem useful based on the presentation? What about safe?)
  - Ajattelitteko esittelyn jälkeen ottavanne Kaikun käyttöön? Miksi, miksi ei? (Did you think that you would start using Kaiku after the presentation? Why, why not?)

#### 3.1.1 Palvelua käyttävät/kokeilleet (For those who use/have tried the use of the service)

- Kertoisitko Kaikun käyttöönoton etenemisestä? (Would tell about the initiation of the use of Kaiku?)  
*Tarvittaessa (if needed)*

- Minkälaiset asiat saivat kiinnostumaan palvelun kokeilusta? (What kind of matters awoke interest towards trying out the use of the service?)
- Millaisia ajatuksia Kaikun käyttöönotto herätti? (What kind of thoughts did the start of Kaiku's use raise?)
- Epäilyttikö joku palvelun käyttöön ottamisessa? (Were there something that concerned you with starting to use the service?)
- Esiintyikö käytön aloittamisessa haasteita? (Were there any challenges with the initiation of the use?)
- Kaipasitteko tukea käytön aloittamiseen? Oliko tukea tarjolla? (Did you need support with initiation of the use? Was there support available?)

### **3.1.2 Eivät kokeilleet palvelua (For those who did not try the use of the service)**

- Minkälaiset asiat vaikuttivat siihen, että ette kokeilleet Kaikun käyttöä? (What kind of matters affected that you did not try Kaiku's use?)  
*Tarvittaessa (if needed)*
  - Epäilyttikö palvelussa jokin? (Did you have some doubts about the service?)
- Olisiko Kaikun kokeilua voinut edistää jollain tavalla? (Was there something that could have promoted you to try Kaiku?)  
*Tarvittaessa (if needed)*
  - Mikä olisi tehnyt Kaikun käytöstä kiinnostavamman tuntuista? (What would have made Kaiku's use seem more interesting?)
  - Tarjottiinko palvelun käyttöä kerran vai useammin? (Was the use of the service offered once or more often?)
  - Tarjottiinko palvelun käytön aloittamiseen jonkinlaista tukea? Olisitteko kaivanneet jonkinlaista tukea? (Was there some support available for initiation of the service? Would you have needed some support?)
  - Onko Kaikun käytön mahdollisuus käynyt mielessä myöhemmin? (Have you considered the possibility to use Kaiku later on?)

## **3.2 Kaikun käyttö (Kaiku's use)**

### **3.2.1 Palvelua käyttävät (For those who use the service)**

- Kertoisitteko viime kerrasta, kun käytitte Kaikua? (Would you tell about the last time you used Kaiku?)
- Millaisia muita tapoja teillä on käyttää Kaikua? (In what other ways do you use Kaiku?)  
*Tarvittaessa (if needed)*
  - Millaisia tunteita Kaikun käyttäminen herättää? (What kind of feelings does Kaiku's use raise?)
  - Millaiset asiat palvelun käytössä miellyttävät? Millaiset mahdollisesti eivät? (What pleases you about the service? What does not?)
  - Millaisissa tilanteissa Kaiku tuntuu hyödylliseltä? (In what kind of situations does Kaiku seem useful?)
  - Vastaako Kaikun käyttö jonkinlaisiin tarpeisiin? (Does Kaiku's use fulfill some kind of needs?)
  - Miten Kaikun käyttö sujuu? (How does Kaiku's use go?)
  - Tuntuuko Kaikun käyttö helpolta? (Does Kaiku's use seem easy?)
- Onko Kaikun käytössä esiintynyt ongelmia/vaikeuksia? (Has any difficulties come up with the use of Kaiku?)  
*Tarvittaessa (if needed)*
  - Yleisyys? (How often?)
  - Toistuvia vai erilaisia uusia ongelmia? (Recurrent or new kinds of problems?)

- Keksitkö syitä tai ratkaisuja ongelmille? (Can you come up with reasons or solutions for the problems?)
- Onko ongelmiin saatavilla tukea? (Is there support available for the problems?)
- Millä tavoin Kaiku voisi olla teille hyödyllisempi? (In what ways could Kaiku be more useful?)
- Voisiko Kaikon käyttöä jotenkin helpottaa? (Could something make Kaiku's use even more useful?)

### 3.2.2 Palvelun käyttöä kokeilleet (For those who tried to use the service)

- Miten sitten käytitte Kaikua? (How did you use Kaiku?)  
*Tarvittaessa (if needed)*
  - Minkälainen oli tavallinen käyttökerta? (Could you describe a typical instance of use?)
  - Miten pitkään käytitte Kaikua? (For how long did you use Kaiku?)
  - Miten paljon käytitte palvelua tuona aikana? (How much did you use the service during that time?)
  - Miten palvelun käyttö sujui? (How did the use go?)
  - Tuntuiko Kaikon käyttö helpolta/vaikealta? (Did Kaiku's use seem easy/difficult?)
  - Mikä palvelussa miellytti? Mikä ei? (What pleased you about the service? What did not?)
  - Millä tavalla Kaikon käyttö tuntui hyödylliseltä? Millä tavalla ei? (How did Kaiku's use seem useful? How did it not?)
  - Vastasiko Kaiku jonkinlaisiin tarpeisiin? (Did Kaiku answer some kind of needs?)
- Kertoisitteko Kaikon käytön loppumisesta? (Would you tell about stopping to use Kaiku?)  
*Tarvittaessa (if needed)*
  - Millaiset asiat vaikuttivat Kaikon käytön lopettamiseen? (What kind of matters affected discontinuing Kaiku's use?)
  - Mikä voisi tehdä palvelusta hyödyllisemmän? (What could make the service more useful?)
  - Olisiko Kaikon käyttöä jotenkin helpottaa? (Was there something that could make the use of the service easier?)
  - Koitteko, että palvelusta olisi ollut jotain haittaa tai vaivaa? (Did you feel that the service would have caused some trouble?)
- Mitä olisitte kaivannut Kaikulta jatkaaksenne käyttöä? (What would you have needed from Kaiku in order to continue the use?)

## 4 Muuta mieleen tulevaa (Other)

- Suositteko Kaikua muille? (Would you recommend Kaiku for others?)
  - Mitä kertoisitte palvelusta heille? (What would you tell them about the service?)
- Tuleeko mieleen jotain muuta palveluun liittyen? Yleisiä kommentteja, risuja, ruusuja, kehitysideoita? (Is there anything else that occurs to you regarding the service? Any general comments, any critiques, any praises, any development ideas?)
- Entä haastatteluun/tutkimukseen liittyen? (How about regarding the interview or the study?)

## Appendix 2 – Quotations

Table 2-I: The final codes and their prevalence in the data.

Code	Amount of quotations	Number of interviews of appearances
Active participation	27	11
Care/treatment related factors	70	11
Communication	84	12
Condition related factors	27	7
Continuity and integration	60	12
Health status	46	11
Improvement ideas	32	7
Information	65	12
IT related factors	23	9
IT skills	18	12
Kaiku related factors	72	10
Kaiku's effect on PX	49	8
Kaiku's potential effect on PX	44	9
Lived experience and perceptions	136	12
Other facilitators/hindrances	23	7
Other interesting	20	9
Perceived ease of use	48	9
Perceived usefulness	83	12
Responsiveness and individualization	83	12
Support	49	12
Use-case communication	44	10
Use-case PRO	40	8

*Table 2-II: The distribution of quotations across interviews.*

Interview ID	Amount of quotations	Amount of different codes
1	48	18
2	24	17
3	56	13
4	82	21
5	76	21
6	45	20
7	42	17
8	29	15
9	63	20
10	50	19
11	60	21
12	62	20

### Appendix 3 – Complete Results

Table 3-I: Facilitators and hindrances for adoption and acceptance of Kaiku. (N = number of interviewees who mentioned the specific facilitator or hindrance)

Category	Facilitators	Hindrances	Count	N
<i>Care/treatment related factors</i>			70	11
		Preference for/confidence in traditional methods of communication, information etc.	21	7
	Enabling of faster/lower effort/more convenient communication		10	5
		Consideration of the phase of the treatment and the content of the questions	5	2
	Obligation towards medical professionals		4	4
	Relevance for medical staff		4	4
	Bringing medical professionals closer/more accessible		4	3
	Reactions from medical professionals		3	2
		Reactions from medical professionals	1	1
		Needing/wanting acute contact with medical professionals	4	2
	Maintaining patient/customer relationship		4	2
	Positive effects on appointments		3	2
	Enhancement of information flow between patient and medical professionals		2	2
		Distorted information	2	2
	Effects for prognosis		2	1
	Trust in medical provider for relevance and security		1	1
<i>Condition related factors</i>			27	7

		Lack of energy to use due to weak condition	9	3
		Lack of interest to use due to good condition	8	4
		Lack of need to report symptoms due to their clarity	5	2
	Potential use in case of adverse effects		4	2
		Lack of need to report symptoms more often than during appointments due to little symptoms	1	1
<i>IT related factors</i>			23	9
		Little or no IT use	10	4
	Accessible IT support		2	2
		Accessible IT support	1	1
	Confidence in IT implicated by medical professionals		2	2
	Confidence in IT skills		2	2
		Lack of interest towards IT	2	2
		Assumed little or no IT use	1	1
	Assumed confident IT use		1	1
		Uncertainty with IT	1	1
		Anxiety about the vast possibilities for information search	1	1
<i>Kaiku related factors</i>			72	10
	Perceived ease of use		25	8
		Perceived ease of use	2	2
	Kaiku's idea perceived good/interesting		11	8
	Praises for Kaiku's performance		7	4
		Lack of relevance for own situation	7	2
		Lack of clarity	5	3
		Disappointment with Kaiku	4	3

		Kaiku seen as separate from medical professionals	3	3
	Connection to personal health		2	2
		Lack of (initial) interest towards the idea	2	2
	Potential to develop Kaiku		2	1
	Trust in security and privacy		1	1
	Availability of technical support		1	1
<i>Other facilitators/ hindrances</i>			23	7
		Personal characteristics	5	2
	Personal characteristics		2	2
		Ability to internalize information when Kaiku is presented	4	3
		Forgetting about the possibility of the service	3	3
		Peer support activities	3	1
		Lack of interest to actively follow on health	2	2
		Other hastes decreasing interest towards Kaiku	2	1
		Lack of effects to one's life	1	1
	Independent acquirement of information on Kaiku		1	1

Table 3-II: Patient experience themes (*N* = number of interviewees who mentioned the specific aspect/theme)

Theme	Aspect	Count	N
<i>Active participation</i>		27	11
	Selection of a private clinic	12	7
	Decision-making regarding treatment	4	3
	Actively providing information on own situation to the medical professionals	2	2
	Actively taking care of one's condition	2	2
	Gaining control on the disease	1	1
	Keeping records of one's health data	1	1
	Health insurance enabled follow-up	1	1
	Seeking for another opinion	1	1



	Seeking for psychological support from medical professionals	1	1
	Seeking optional health check-up	1	1
	Taking responsibility of progress of care	1	1
<i>Communication</i>		84	12
	Reactions from medical staff	16	5
	Describing one's condition in own words	13	5
	Reciprocal communication	6	6
	Quick communication	6	5
	Simple communication needs	6	2
	Possibility to ask questions	5	4
	Fluent communication	4	3
	Difficulties with communication	4	3
	Low effort communication	3	3
	Preferring face-to-face communication	3	3
	Thanking medical staff	3	2
	Urgent communication	3	2
	Real-time communication	2	2
	Ability to internalize information	2	2
	Individual communication needs	2	2
	Continuous/regular communication	1	1
	Communication effecting prognosis	1	1
	Wordless communication	1	1
	Limited time for communication	1	1
	Encouragement to report about own condition	1	1
	Calling to doctor	1	1
<i>Continuity and integration</i>		60	12
	Accessibility of medical staff/care	17	8
	Continuous care	15	7
	Familiarity of medical staff	12	7
	Maintaining customer/patient relationship	4	3
	Trust in medical staff	4	2
	Recognition of expertise	2	2
	Presentation of one's treatment path	2	1
	Acknowledgement of other medical needs	1	1
	Difficulties to access health services	1	1
	Noting personal preferences	1	1
	Reminders of appointments	1	1
<i>Information</i>		65	12
	Information on own situation	19	8
	Information on treatments	16	6
	Information on cancer	14	8
	Information on own history	3	3
	Accessible information	3	3
	Making sense of one's one health	3	3
	Quick information	2	2

	Information on effects to different life areas	2	1
	Information on general practicalities	1	1
	Focused information source	1	1
	Sufficient information	1	1
<i>Lived experience and perceptions</i>		136	12
	(Ways of) coping with the situation	19	8
	Adverse effects	17	8
	Effects to everyday life	15	7
	Effects of physical symptoms	10	6
	Effects to social relationships	9	5
	Effects to close ones	9	5
	Negative emotions/reactions	7	6
	Uncertainty of the future	7	5
	Psychological effects	7	4
	Feeling normal	6	5
	Other difficulties in life affecting outlook on cancer	6	3
	Diagnosis shock/surprise	5	3
	Getting used to the situation	5	2
	Feeling better (than expected)	4	2
	Positive emotions/reactions	3	2
	Effects of feelings to ability to internalize information	2	2
	Acting as an example to others	2	2
	Extensive investigations to find reason for symptoms	2	2
	Varying condition	1	1
<i>Responsiveness and individualization</i>		83	12
	Satisfaction with care	16	8
	Good response for treatment	12	9
	Delay in progress of treatment	10	6
	Personal care	6	5
	Immediate care	6	4
	Individual needs and situations	6	4
	Competence of medical staff	5	4
	Adjusting care to individual needs	4	4
	Unpleasant/confusing care experience/procedure	4	2
	Setback with treatment	3	3
	Thorough care from medical staff	2	2
	Acknowledging phase of treatment	2	2
	Fluency of care	2	1
	Non-clinical related services	1	1
	Lack of being taken seriously	1	1
	Lack of individualization	1	1

	Meeting clinical needs	1	1
	Acknowledging condition-related needs in broader life context	1	1
<i>Support</i>		<i>49</i>	<i>12</i>
	Support from close ones	25	9
	Peer support activities	15	5
	Support from medical staff	5	3
	Support to use Kaiku	2	2
	Support from work	2	2